This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

Usage guidelines

Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

We also ask that you:

+ *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.

+ *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.

+ *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.

+ *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

About Google Book Search

Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at `http://books.google.com/`

UC-NRLF
B 4 314 010

LIBRARY
OF THE
DENTAL DEPARTMENT,
UNIVERSITY OF CALIFORNIA.

This book must be returned within four days. Fine, five cents each day for further detention.

Digitized by Google

Digitized by Google

Digitized by Google

Digitized by Google

Digitized by Google

10670

University of California

TRANSACTIONS

OF THE

World's Columbian Dental Congress

CHICAGO, AUGUST 14, 15, 16, 17, 18 AND 19, 1893.

IN TWO VOLUMES.

VOLUME I.

EDITED FOR THE GENERAL EXECUTIVE COMMITTEE BY
A. W. HARLAN, A.M., M.D., D.D.S.

ASSISTED BY
LOUIS OTTOFY, D.D.S.

COMMITTEE ON PUBLICATION:
A. W. HARLAN, A. O. HUNT, LOUIS OTTOFY.

CHICAGO, ILLINOIS:
PRESS OF KNIGHT, LEONARD & CO.
1894.

Digitized by Google

PUBLISHED BY ORDER
OF THE
GENERAL EXECUTIVE COMMITTEE.

A. W. HARLAN, A. M., M. D., D. D. S., Secretary-General of the Congress.

Digitized by Google

Accession No. 223

LIBRARY
COLLEGE OF DENTISTRY
UNIVERSITY OF CALIFORNIA
SAN FRANCISCO.

DISCLAIMER.

The World's Columbian Dental Congress, although formally accepting and publishing the reports of the general sessions, and several sections, and the essays read before them, holds itself wholly irresponsible for the opinions, theories or criticisms therein contained, except when otherwise decided by order or resolution.

Digitized by Google

Digitized by Google

VOLUME I.—CONTENTS.

Disclaimer, ... v
Contents, ... vii
Organization, ... xi
General Executive Committee, ... xiii
Officers, ... xiv
Foreign Officers, ... xv
Committees, ... xxiii
Officers of the Sections, ... xliii
General Sessions, ... 3
Address of President Bonney, ... 3
Address of Dr. W. W. Walker, ... 4
Resolutions Creating the Congress, ... 6
Address of Welcome by Dr. J. Y. Crawford, ... 7
Letter from Dr. W. W. H. Thackston, ... 9
Letter from Dr. W. H. Morgan, ... 10
Inaugural Address by the President of the Congress, Dr. L. D. Shepard, ... 11
Reception of Foreign Representatives, ... 32
Letter from Dr. Thomas W. Evans, ... 40
Reception of Foreign Representatives, ... 42
Beiträge zur Kentniss der Enstehungsursache der Hypoplastischen Emaildefecte, von Dr. Otto Zsigmondy, 48
Discussion, ... 64
Concerning Various Methods Advocated for Obviating the Necessity of Extracting Devitalized Tooth Pulps, by Dr. W. D. Miller, ... 68
Discussion, ... 78
A Contribution to the Study of the Development of the Enamel, by Dr. R. R. Andrews, ... 83
On Some of the Forces that Influence the Form of the Jaws and Teeth During the Process of Development, by Dr. W. X. Sudduth, ... 96
Discussion, ... 101
Among the Ancient Hawaiians, by Dr. J. M. Whitney, . 102

Digitized by Google

Address by Dr. Corydon Palmer, ... 112
Some Changes that Take Place in and around the Pulp Canal, by D. E. Caush, L.D.S., ... 114
Discussion, ... 123
Discussion on: To what Extent is Interrupted Primary Dentition an Etiological Factor in the Diseases Incident Thereto, more Especially Pulmonary, Digestive and Intestinal Disorders, ... 125
Luxation, or the Immediate Method in the Treatment of Irregular Teeth, by Dr. George Cunningham, . . 129
Discussion, ... 147
Exhibition of an Instrument for Measuring the Muscular Power of the Jaw, by Dr. J. J. R. Patrick, . . 151
English Tube Teeth, their Use in Plate, Crown and Bridge Work, by Dr. John Girdwood, ... 153
Hypnotic Suggestion as an Obtundent and Sedative, by Dr. Thomas Fillebrown, ... 178
Resolution of Thanks, ... 201
Report of Committee No. 21, on the Care of the Teeth of the Poor, ... 201
Report of Committee No. 20, to Promote the Appointment of Dentists in the Armies and Navies of the World, . 203
Report of Committee No. 23 on Prize Essays, . . 206
Remarks from Foreign Representatives, ... 208
Miscellaneous Business, ... 211

SCIENCE—DEPARTMENT A.

SECTION I.

Anatomy and Histology.

Address by Dr. R. R. Andrews, ... 223
What has Dentistry to Demonstrate Against the Hypothesis of Organic Evolution, by Dr. W. G. A. Bonwill, . 226
Discussion, ... 240
The Teeth and Hair, their Homology and Pathological Intimacy, by Dr. S. H. Guilford, ... 251
Discussion, ... 264
Teeth of the Lower Jaw at Birth, by Dr. Frank Abbott, . 266

Digitized by Google

Discussion, ... 288
The Pedigree of the Central Incisor, by Dr. A. H. Thompson, 291
Discussion, ... 298
The Human Temperament in its Relation to the Human Tooth, by Dr. E. M. Flagg, ... 301
Discussion, ... 312
Discussion on Hypnotic Suggestion as a Dental Obtundent and Sedative, ... 316

SECTION II.

Etiology, Pathology and Bacteriology.

Address by Dr. G. V. Black, ... 325
Adenoid Growths and other Diseases Incident to Primary Dentition, by Dr. Annie Felton Reynolds, . . 328
Discussion, ... 333
Pulpitis Chronica Idiopathica, von P. Macarovici, . . 336
Discussion, ... 348
The Relation of Predisposing Causes (so-called) to the Active Causes of Dental Decay, by Dr. L. C. Ingersoll, 349
Discussion, ... 360
Oral Pathology, by Dr. R. Finley Hunt, ... 362
Discussion, ... 369
Pathological Conditions of the Air Cavities of the Cranium Resulting from Dental Lesion, by Dr. I. P. Wilson, . 374
Discussion, ... 383
Palatal Diseases as Applied to Dentistry—Pathology and Cases, by Dr. Vida A. Latham, ... 389
Discussion, ... 404
Some Facts, with Models, Showing the Relationship of the Dental Inter-Articulation with More or Less Obscure Pains about the Teeth and Jaws, by Dr. L. Van Orden, 404

SECTION III.

Chemistry and Metallurgy.

Address by Dr. D. R. Stubblefield, ... 411
The Study of Chemistry in Dentistry, by Mr. Elbert W. Rockwood, ... 414

Digitized by Google

SECTION IV.

THERAPEUTICS AND MATERIA MEDICA.

Address by Dr. Ferdinand J. S. Gorgas, ... 423
Methode D'anæsthesie Local a L'aide de la Cocaine, par Dr. D. Caracatsanis, ... 425
Cocaine Injections for the Production of Anæsthesia, by Dr. Anthony Bleichsteiner, ... 426
Discussion, ... 436
Obtunding the Sensibility of the Dentine, by Dr. W. C. Davis, ... 457
Chloride of Ethyl as an Anæsthetic, by Hedwig Bensow Stahlberg, ... 462
Discussion, ... 465
A New Apparatus for Maintaining Anæsthesia without a Face Piece, and with the Mouth Open, by Dr. Thomas Fillebrown, ... 467
Discussion, ... 469
Sur le Traitement de la Pyorrhœa, par Dr. D. Caracatsanis, 471
Discussion, ... 473
Extractions des Pulpes des Dents Completement Calcifiés au Moyen de la Trepannation, par P. Poinsot, . . 484
Discussion, ... 486
Experiments with Bichloride of Mercury, by Dr. Carrie M. Stewart, ... 486
Traitement des Absces des Sinus Maxillaire, par Dr. E. Lecaudey, ... 492
La Boricine, par M. Denis, ... 493
Contribution a L'etude de L'action Physiologique de la Cocaine, par M. G. Viau, ... 495

Digitized by Google

THE WORLD'S COLUMBIAN DENTAL CONGRESS.

ORGANIZATION.

WHEREAS, There is to be a World's Columbian Exposition in Chicago, in 1893; and

WHEREAS, In consequence of the fact that the choicest products of the world are there to be displayed, it is expected that citizens in large numbers of all civilized countries will be gathered together there for the purpose of seeing these exhibits; and

WHEREAS, It is to be presumed that many dentists from foreign countries will visit the United States at that time; and

WHEREAS, The time of the Exposition will be an opportune occasion for a great meeting of the dentists of the world; and

WHEREAS, It is believed that a great advance in science and the practice of dental and oral surgery would result from a meeting of the dentists of the United States with those from foreign countries who might then be visiting in this country; and

WHEREAS, It is desirable that any meeting then held should be at the instance of the American Dental Association and the Southern Dental Association, and organized by a joint committee by them appointed; therefore, be it

Resolved, That the president of this Southern Dental Association appoint a committee of five to confer with a like committee that may be appointed at the next meeting of the

Digitized by Google

American Dental Association upon this subject, and that this joint committee have power to fill all vacancies, and shall add to its membership either one, three or five more members, as it may deem advisable, and when this committee is so completed it shall be clothed with full power to take such action as in its judgment it may deem best for creating an organization for the purpose of holding a Dental Congress in the city of Chicago, in 1893, which the reputable dentists throughout the world shall be invited to attend, and that any action that this committee may take in the premises shall be final and binding.

Digitized by Google

GENERAL EXECUTIVE COMMITTEE.

CHAIRMAN.

DR. W. W. WALKER,	New York City.

SECRETARY.

DR. A. O. HUNT,	Iowa City, Iowa.

TREASURER.

DR. J. S. MARSHALL,	Chicago, Illinois.

DR. W. J. BARTON,	Paris, Texas.
DR. L. D. CARPENTER,	Atlanta, Georgia.
DR. J. Y. CRAWFORD,	Nashville, Tennessee.
DR. M. W. FOSTER,	Baltimore, Maryland.
DR. A. W. HARLAN,	Chicago, Illinois.
DR. H. J. MCKELLOPS,	St. Louis, Missouri.
*DR. G. W. MCELHANEY,	Columbus, Georgia.
DR. H. B. NOBLE,	Washington, D. C.
DR. JOHN C. STOREY,	Dallas, Texas.
DR. C. S. STOCKTON,	Newark, New Jersey.
DR. L. D. SHEPARD,	Boston, Massachusetts.
DR. J. TAFT,	Cincinnati, Ohio.

*Deceased.

Digitized by Google

OFFICERS OF THE CONGRESS.

PRESIDENT.

DR. L. D. SHEPARD,	Boston, Massachusetts.

VICE-PRESIDENTS.

DR. W. W. H. THACKSTON,	Farmville, Virginia.
DR. W. H. MORGAN,	Nashville, Tennessee.
DR. A. L. NORTHROP,	New York City.
*DR. W. W. ALLPORT,	Chicago, Illinois.
DR. LOUIS W. LYON,	St. Paul, Minnesota.
DR. J. TAFT,	Cincinnati, Ohio.
DR. W. O. KULP,	Davenport, Iowa.
DR. C. S. STOCKTON,	Newark, New Jersey.
DR. E. T. DARBY,	Philadelphia, Pennsylvania.
DR. H. J. MCKELLOPS,	St. Louis, Missouri.
DR. J. H. HATCH,	San Francisco, California.
DR. J. B. PATRICK,	Charleston, South Carolina.
DR. JOHN C. STOREY,	Dallas, Texas.

SECRETARY-GENERAL.

DR. A. W. HARLAN,	Chicago, Illinois.

ASSISTANT SECRETARIES.

DR. JOSEPH BAUER,	New Orleans, Louisiana.
*DR. W. C. WARDLAW,	Augusta, Georgia.
DR. LOUIS OTTOFY,	Chicago, Illinois.
DR. E. M. S. FERNANDEZ,	Chicago, Illinois.

TREASURER.

DR. J. S. MARSHALL,	Chicago, Illinois.

* Deceased.

Digitized by Google

...ty of California

HONORARY PRESIDENTS, VICE-PRESIDENTS AND SECRETARIES, FROM FOREIGN COUNTRIES.

GREAT BRITAIN.

HONORARY PRESIDENT.

GEO. CUNNINGHAM, M. A., L. D. S., D. M. D., 2 King's Parade, Cambridge, England.

HONORARY VICE-PRESIDENTS.

WILLIAM HERBERT WOODRUFF, L. D. S., 13 New Burlington St., London, W., England.
W. B. MACLEOD, L. D. S., 16 George Square, Edinburg, Scotland.
W. B. PEARSALL, F. R. C. S., 13 Upper Merrion St., Dublin, Ireland.
F. H. BALKWILL, L. D. S., 3 Princess Square, Plymouth, England.

CANADA.

HONORARY PRESIDENT.

DR. W. GEO. BEERS, 47 Union Ave., Montreal, Canada.

HONORARY VICE-PRESIDENTS.

DR. A. C. COGSWELL, Halifax, Nova Scotia.
DR. J. B. WILLMOTT, Toronto, Canada.

HONORARY SECRETARY.

DR. R. H. ROBERTSON, Portage La Prairie, Manitoba.

HONORARY ASSISTANT SECRETARY.

DR. FRED. J. CAPON, Toronto, Canada.

HOLLAND.

HONORARY PRESIDENT.

DR. JOHN E. GREVERS, Oude Turfmarkt 13, Amsterdam.

HONORARY VICE-PRESIDENTS.

DR. A. C. J. KOENAART, Hoogstrasse 219, Rotterdam.
DR. THEO. DENTZ, Kromme Nieuwegracht 31, Utrecht.

GERMANY.

HONORARY PRESIDENT.

DR. ROBT. CARL FRANZ BAUME, Oranienburgerstrasse 58, N., Berlin.

Digitized by Google

HONORARY VICE-PRESIDENTS.

DR. LUDWIG HOLLÄNDER, Markt 13, Halle.
DR. JULIUS PARREIDT, Poststrasse 5, Leipzig.
DR. FREDERICK WILHELM HERBST, 31 Schillerstrasse, Bremen.
DR. WILHELM SACHS, Museumsplatz 7, Breslau.
DR. F. HESSE, Goethestrasse 5, Leipzig.
DR. ADOLPH WITZEL, Hochstrasse 1, Essen.

HONORARY SECRETARY.

Dr. LUDWIG WARNEKROS, Unter den Linden 30, W., Berlin.

HONORARY ASSISTANT SECRETARY.

DR. ERICH RICHTER, Chausseestrasse 1 a, N., Berlin.

BELGIUM.

HONORARY PRESIDENT.

DR. H. BON, 34 Rue de la Loi, Brussels.

HONORARY VICE-PRESIDENTS.

DR. J. VERSCHUREN, Can Recollets 41, Antwerp.
DR. J. BINGE, Rue Casquette 51, Liege.
DR. L. DE PAEPE, Place Station 14, Louvain.
DR. HECT. MINNE, Rue Quellin 25, Antwerp.
DR. J. F. POURVEUR, Rue Tanneurs 42, Antwerp.

HONORARY SECRETARY.

DR. VON BLAIREN, Brussels.

FRANCE.

HONORARY PRESIDENT.

DR. E. LECAUDEY, 64 Boulevard Haussmann, Paris.

HONORARY VICE-PRESIDENTS.

V. ANJUBAULT, 66 Rue de Provence, Paris.
HENRY CRIGNIER, 27 Rue Taitbout, Paris.
M. F. TOUCHARD, 57 Rue Rochechouart, Paris.
CHARLES GODON, 72 Boulevard Haussmann, Paris.

HONORARY SECRETARY.

F. DUCOURNAU, 6 Rue Gaillon, Paris.

SWITZERLAND.

HONORARY PRESIDENT.

DR. C. O. SCHULTHESS, 24 Schützengraben, Basel.

HONORARY VICE-PRESIDENTS.

DR. P. A. KÖLLIKER, Obere Zaune 10, Zürich.
DR. LOUIS ROUSSY, 8 Rue St. Leger, Geneva.

HONORARY SECRETARY.

PAUL WITZIG, L. D. S., 17 Schlüsselberg, Basle.

Digitized by Google

AUSTRIA.

HONORARY PRESIDENT.

DR. H. SCHMID, 3 Jungmannsplatz, Prague.

HONORARY VICE-PRESIDENTS.

DR. JULIUS SCHEFF, JR., Hoher Markt 4, Vienna.
DR. CARL FISHER-COLBRIE, Kohlmarkt 11, Vienna.
DR. ANTON BLEICHSTEINER, Herrengasse 28, Gratz.

HONORARY SECRETARY.

DR. ANTON PAPSCH, Museumstrasse 20, Innspruck.

ROUMANIA.

HONORARY PRESIDENT.

DR. L. GOLDBERGER, Rue Domenica Pailas, A., Hardentz.

HONORARY VICE-PRESIDENTS.

DR. LEMPART, Bucharest, Roumania.
DR. P. MACAROVICI, Strada Golia 75, Jassy.
DR. M. END, Bucharest, Roumania.

SPAIN.

HONORARY PRESIDENT.

DR. FRANCISCO CARBONELL, Rambla de San Jose 22, Barcelona.

HONORARY VICE-PRESIDENTS.

DR. TIRSO PEREZ, Calle Mayor 73, Madrid.
DR. JUAN DE OTAOLA, Calle Somera 51, Bilboa.
DR. M. TRALLERO, Barcelona.
DR. A. TRIVINO, Calle de la Montera 29, Madrid.
DR. R. H. PORTUONDO, Infantas, 28–30, Madrid.

HONORARY SECRETARY.

DR. FLORESTAN AGUILAR, San Jose 2, Cadiz.

PORTUGAL.

HONORARY PRESIDENT.

Y. P. G. PAVIA, Travessa Assumpcao 103, Lisbon.

HONORARY VICE-PRESIDENTS.

CARL KOTH, Lisbon.
ANTONIO DA SILVA, Plaza de Dom Pedro 26, Oporto.

ITALY.

HONORARY PRESIDENT.

CESARE CAMPANI, Sig. Cav. Dott., Piazza delle Signori 5, Florence.

HONORARY VICE-PRESIDENTS.

PIETRO RIBOLLA, Sig., Dela Reale Casa, Rome.
FRANCISCO GARELLI, Sig. Cav. Dott., Via Roma 15, Turin.

Digitized by Google

DR. CARLO PLATSCHICH, Via Bassano Porrone 8, Milano.
DR. ANTONIO DAMIANO MELA, Salita Santa Canterino I., Genoa.
DR. LUIGI RIBOLLA NICODEMI, Palermo.

HONORARY SECRETARY.

DR. GUISEPPE CALI, Neapel Strada Taverna Penta 33, Rome.

GREECE.

HONORARY PRESIDENT.

DR. D. CARACATSANIS, Place de la Concorde, Athens.

HONORARY SECRETARY.

DR. CH. AGHABEY, Xenophon 2, Athens.

BULGARIA.

HONORARY PRESIDENT.

DR. I. A. MUSZLER, Sofia.

SERVIA.

HONORARY PRESIDENT.

DR. STEIC, Belgrad.

DENMARK.

HONORARY PRESIDENT.

DR. V. HADERUP, Kongens Nytow 3, Copenhagen.

HONORARY VICE-PRESIDENTS.

DR. C. THORLAKSON, Fredriksborggade 12, Copenhagen.
DR. J. A. KJARTINGE, Aarhuns.
DR. L. ED. FULBIUS, Boldhunsgade 2, Copenhagen.
DR. CHR. KJAER, Odense.

HONORARY SECRETARY.

DR. J. L. SECHER, Amegertow 25, Copenhagen.

NORWAY.

HONORARY PRESIDENT.

DR. A. J. HOVLAND, Lille Grendsegade 4, Christiania.

HONORARY VICE-PRESIDENTS.

DR. M. ANDERSEN, Bergen.
DR. O. A. OLSEN, Christiansand.
DR. H. O. HEIDE, Storthinsgaden 6, Christiania.
DR. M. H. BEUTZEN, Bergen.

HONORARY SECRETARY.

DR. CARL KAAS, Universitetsgaden 18, Christiania.

Digitized by Google

RUSSIA.

HONORARY PRESIDENT.

DR. T. E. WAGINSKI,	Gorokow St. 59, St. Petersburg.

HONORARY VICE-PRESIDENTS.

DR. F. WITAS RHODE,	Dorpat.
DR. TYSCHINSKI,	Rue de Richelieu, Odessa.
DR. J. J. CHRUSTCHOW,	Newsky 43, St. Petersburg.
DR. ANTONI KASPROWICZ,	Krowlewska 5, Warsaw.
DR. PAUL ADELHEIM,	Schmeide-Brücke, Moscow.
DR. M. WILHELM PRAWEDNY,	Nikolskaja 48, St. Petersburg.

HONORARY SECRETARY.

DR. FERDINAND KLAPPROTH,	Kirpischnij Pr. 1, St. Petersburg.

SWEDEN.

HONORARY PRESIDENT.

*DR. FRANZ BERGGREN,	Stockholm.
DR. E. SJOBERG,	Drottingsgaten 45, Stockholm.

HONORARY VICE-PRESIDENTS.

DR. J. A. BYGREN,	Stora Nygatan 15, Goteborg.
DR. J. VICTOR BENSOW,	Sodra Hamngatan 59, Goteborg.
DR. O. ULMGREN,	Malskilnadsgatan 38, Stockholm.

HONORARY SECRETARY.

DR. ELÖF FORBERG,	Hamngatan 10, Stockholm.

FINLAND.

HONORARY PRESIDENT.

DR. TH. WEBER,	Helsingfors.

HONORARY VICE-PRESIDENTS.

DR. ÄYRAPÄÄ,	Helsingfors.
DR. WIN OLANDER,	Helsingfors.

TURKEY.

HONORARY PRESIDENT.

DR. FRANK R. FABER,	Constantinople.

SOUTH AMERICA.

HONORARY PRESIDENTS.

DR. J. S. JENKINS,	Lima, Peru.
DR. JOAS FERREIRA,	Campinas, Brazil.
DR. A. SALCEDO,	Calle 14, No. 105, Bogota, U. S. Colombia.
DR. CABALLERO,	Calle Maipu 294, Buenos Ayres, Argentine Republic.

* Deceased.

Digitized by Google

DR. W. A. ISARD,	Calle Cangello 691, Buenos Ayres, Argentine Republic.
DR. A. CARBALLO,	Calle de San Jose 120, Montevideo, Uraguay.
DR. J. S. BURNETT,	Salto, Uraguay.
DR. MANUEL G. RAMOS,	Guayaquil, Ecuador.
DR. FERMAN F. LINCE,	Guayaquil, Ecuador.
DR. RAYMON F. COY,	Lima, Peru.
DR. F. COQUET,	Calle Maipu 294, Buenos Ayres, Argentine Republic.
DR. C. KOTH,	Rio de Janeiro, Brazil.
DR. J. W. COACHMAN,	Rio de Janeiro, Brazil.
DR. F. E. ROBINSON,	Iquique, Chili.
DR. JUAN ESTRELLA,	Lima, Peru.
DR. CHAPOT PREVOST,	Rio de Janeiro, Brazil.
DR. PEREIRA,	Rio de Janeiro, Brazil.
DR. JOAQUIN CAMARA,	Pernambuco, Brazil.
DR. RAYMON ARAYA,	Santiago, Chili.
DR. N. ETCHAPARABORDA,	Buenos Ayres, Argentine Republic.
DR. ALEX. MCG. DENHAM,	Monjitas 68¾, Santiago de Chili.
DR. GEO. B. NEWLAND,	107 Calle Florida, Buenos Ayres, Argentine Republic.
DR. NUMA POMPILIO,	Rua do Bardo da Victoria, Pernambuco, Brazil.
DR. RAMIREZ,	Valparaiso, Chili.
DR. EBEN M. FLAGG,	Asuncion, Paraguay.
DR. G. VARGAS PAREDES,	Republic of Colombia.

CENTRAL AMERICA.

HONORARY PRESIDENTS.

DR. GUILLERMO HUNTER,	Leon, Nicaragua.
DR. ARTHUR KOEHPKE,	Panama, Isthmus of Panama.
DR. J. LUIS ESTRADA,	Guatemala City, Guatemala.
DR. A. LACAYO,	Granada, Nicaragua.
DR. RAYMOND,	San Salvador, San Salvador.
DR. ANTONIO RODRIQUEZ,	Alajuela, Costa Rica.

MEXICO.

HONORARY PRESIDENTS.

DR. E. BREMER,	Matamoras.
DR. J. W. BASTOW,	Colima.
DR. RIO RICO,	Empredradillo 11, City of Mexico.
DR. JOSE M. SORIANO,	Empredradillo 3, City of Mexico.
DR. J. K. FOSTER,	Guanajuata.
DR. A. H. WHEELER,	Oaxaca.

Digitized by Google

WEST INDIES.

HONORARY PRESIDENTS.

DR. JOSE TRAJILLO,	110 Aguacate, Havana, Cuba.
DR. ARTHUR GARESCHE,	Cardenas, Cuba.
DR. JAMES GORDON,	St. Thomas, Danish West Indies.
DR. F. D. CROSBY,	St. Johns, Antigua, West Indies.
DR. MIGUEL GUTIERREZ,	105 Neptune St., Havana, Cuba.
DR. JUAN MERELES,	Calle de la per Severinagu 16, Havana, Cuba.
DR. CHAS. H. DALY,	Trinidad, Isle of Trinidad.
DR. P. ALOMA MARTINEZ,	Guanrabo 30, Trinidad, Cuba.
DR. JULIO LYON,	San Domingo, Hayti.

AUSTRALIA AND NEW ZEALAND.

HONORARY PRESIDENTS.

DR. H. H. NORMAN,	50 North Terrace, Adelaide, S. Australia.
DR. P. CRANK,	64 North Terrace, Adelaide, S. Australia.
DR. G. W. TROTT,	North Terrace, Adelaide, S. Australia.
DR. C. F. FYFFE,	107 Collins St., E. Melbourne, Australia.
DR. J. BELISARIO,	4 Lyon Terrace, Hyde Park, Sydney, New South Wales.
DR. ALFRED BURNE,	Sydney, New South Wales.
DR. R. NORMAN,	Myoda Villa, St. George's Terrace, Perth, West Australia.
DR. H. P. RAWSON,	Wellington, New Zealand.

AFRICA.

HONORARY PRESIDENTS.

DR. R. J. BARCLAY,	41 Grave St., Capetown, Cape of Good Hope.
DR. B. F. HUTCHINSON,	2 New St., Capetown, Cape of Good Hope.
DR. G. W. BAYLIS,	239 Smith St., Durban, Natal, Africa.
DR. J. R. BILL,	High St., Grahamstown, South Africa.
DR. J. BROWN,	Dutoitspar Road, Kimberly, Africa.
DR. F. STRICKLAND,	Park Drive, Port Elizabeth, S. Africa.
DR. R. C. WALKER,	Box 212, Cairo, Egypt.
DR. J. F. LOVE,	Rue Nebbie el Daniel, Alexandria, Egypt.

ASIA.

HONORARY PRESIDENTS.

DR. F. E. DAVER,	25 Rampart Row, Bombay, India.
DR. BROMLEY,	Dean Lane, Bombay, India.

Digitized by Google

DR. CAMPBELL,	Dean Lane, Bombay, India.
DR. WOODS,	25 Chowringhes Road, Calcutta, India.
DR. RANGER,	25 Chowringhes Road, Calcutta, India.
DR. A. E. JONES,	Lahore, Punjaub, India.
DR. L. S. CLARK,	3 South Parade, Bungalore, India.
DR. A. O'MERA,	St. Marks, Simla, India.
DR. CHEONG CHUN TIN,	27th St., Bridge Road, Singapore, Straits Settlement.
DR. R. H. KIMBALL,	Shanghai, China.
DR. D. E. PETERSEN,	Shanghai, China.
DR. S. YENOMOTO,	84 Schibei Nichome, Azaka, Tokic, Japan.
DR. S. N. ISAWA,	4 Tonezaka Mache Azaka, Tokio, Japan.
DR. KISAYI TAKAYAMA,	Tokio, Japan.
DR. HUME PURDIE,	Colombo, Island of Ceylon.

HONORARY OFFICERS OF THE AMERICAN CONTINGENT IN FOREIGN COUNTRIES.

PRESIDENT.

DR. THOMAS W. EVANS,	15 Rue de la Paix, Paris, France.

VICE-PRESIDENTS.

DR. GEO. W. FIELD,	23 Park St., Park Lane, London W., England.
DR. W. D. MILLER,	W. Lennestrasse 3, Berlin, Germany.
DR. N. S. JENKINS,	Walpurgisstrasse 15, Dresden, Germany.
DR. E. M. THOMAS,	Petersplatz 7, Vienna, Austria.
DR. J. G. VAN MARTER,	81 Via Nazionale, Rome, Italy.
DR. L. C. BRYAN,	Steinengraben 46, Basle, Switzerland.
DR. A. H. SYLVESTER,	Sommerstrasse 2, W. Berlin, Germany.
DR. H. C. EDWARDS,	Biarritz, France.
DR. J. M. WHITNEY,	Honolulu, Hawaii.
DR. J. WARD HALL,	Shanghai, China.
DR. I. B. DAVENPORT,	30 Avenue de l'Opera, Paris, France.
DR. H. H. EDWARDS,	Calle de Recoletos 12, Madrid, Spain.

SECRETARY.

DR. FRANK S. BUCKLEY,	W. Lennestrasse 3, Berlin, Germany.

Digitized by Google

COMMITTEE OF CONFERENCE FOR THE WORLD'S CONGRESS AUXILIARY.

The World's Columbian Exposition organized the World's Congress Auxiliary, which has received the recognition and support of the government of the United States.

The purpose of the World's Congress Auxiliary is to establish a series of Congresses in which the best workers in General Science, Philosophy, Literature, Art, Agriculture, Trade and Labor may meet to present their experiences and results obtained in all those various lines of thought up to the present time.

In the interest of this movement the Committee on the Dental Congress was appointed by the World's Congress Auxiliary who will be in co-operation with the General Executive Committee of the World's Columbian Dental Congress. The World's Congress Auxiliary have already provided a place of meeting for the Dental Congress which the General Executive Committee have accepted. The World's Congress Auxiliary also requested that the General Executive Committee should appoint a Committee of Conference from the Dental Profession to become a Committee of Conference for the Auxiliary. It is intended by the World's Congress Auxiliary that during the meeting of the various Congresses to have some days or evenings devoted to the interest of the public in the form of addresses, entertainments, etc. Therefore the Committee of Conference was appointed at the request of President Bonney, of the World's Congress Auxiliary, in order that he might have an authorized body from the profession to aid him in making the proper selections for these entertainments, and to assist him in making the meetings a success.

Digitized by Google

W. D. MILLER,	W. Lennestrasse 3, Berlin, Germany.
F. BUSCH,	Berlin, Germany.
G. W. SPARROCK,	Lima, Peru.
W. B. MACLEOD,	16 George Square, Edinburg, Scotland.
A. W. W. BAKER,	18 Lower Fitz William St., Dublin, Ireland.
EARNEST SJOBERG,	Drottingsgaten 45, Stockholm, Sweden.
W. H. COFFIN,	94 Cornwall Gardens, South Kensington, London, England.
W. GEO. BEERS,	47 Union Ave., Montreal, Canada.
E. LECAUDEY,	64 Boul'd Haussmann, Paris, France.
J. G. VAN MARTER,	87 Via Nazionale, Rome, Italy.
CARLO PLATSCHICH,	Via Meravigh 2, Milano, Italy.
JOSEPH ARKÖVY,	Budapest, Hungary.
C. FEDARD,	Geneva, Switzerland.
W. H. MORGAN,	Nashville, Tennessee.
W. H. DWINELLE,	New York City.
*R. B. WINDER,	Baltimore, Maryland.
ELISHA G. TUCKER,	Boston, Massachusetts.
W. W. H. THACKSTON,	Farmville, Virginia.
†J. B. RICH,	Washington, D. C.
*W. H. EAMES,	St. Louis, Missouri.
†J. B. PATRICK,	Charleston, South Carolina.
F. J. S. GORGAS,	Baltimore, Maryland.
G. V. BLACK,	Jacksonville, Illinois.
†R. FINLEY HUNT,	Washington, D. C.
BENJAMIN LORD,	New York City.
A. L. NORTHROP,	New York City.
H. C. EDWARDS,	Maison Sarton, Biarritz, France.
*W. W. ALLPORT,	Chicago, Illinois.
W. W. WALKER,	New York City.
L. D. CARPENTER,	Atlanta, Georgia.
J. Y. CRAWFORD,	Nashville, Tennessee.
W. J. BARTON,	Paris, Texas.
J. TAFT,	Cincinnati, Ohio.
C. S. STOCKTON,	Newark, New Jersey.
L D. SHEPARD,	Boston, Massachusetts.
H. J. MCKELLOPS,	St. Louis, Missouri.
A. O. HUNT,	Iowa City, Iowa.
H. B. NOBLE,	Washington, District of Columbia.
*GEO. W. MCELHANEY,	Columbus, Georgia.
J. C. STOREY,	Dallas, Texas.
M. W. FOSTER,	Baltimore, Maryland.
A. W. HARLAN,	Chicago, Illinois.
J. S. MARSHALL,	Chicago, Illinois.

* Deceased.
† Not registered.

Digitized by Google

C. N. PEIRCE,	Philadelphia, Pennsylvania.
†A. WARNER, JR.,	San Francisco, California.
GEORGE H. CUSHING.	Chicago, Illinois.
W. HERBST,	Schillerstrasse 31, Bremen, Germany.
WM. JARVIE,	Brooklyn, New York.
†R. E. WATKINS,	Eutaw, Alabama.
S. B. BROWN,	Fort Wayne, Indiana.
†S. A. MAIN,	New York City.
H. A. SMITH,	Cincinnati, Ohio.
C. R. BUTLER,	Cleveland, Ohio.
†CHAS. J. ESSIG,	Philadelphia, Pennsylvania.
JAMES TRUMAN,	Philadelphia, Pennsylvania.
GARRETT NEWKIRK,	Chicago, Illinois.
†A. R. EATON,	Elizabeth, New Jersey.
W. J. YOUNGER,	San Francisco, California.
†H. M. HUNTER,	San Antonio, Texas.
W. R. PATTON,	Gereonstrasse 34, Cologne, Germany.
F. H. BALKWILL,	3 Princess Square, Plymouth, England.
R. T. STACK,	10 Westland Row, Dublin, Ireland.
W. B. PEARSALL,	13 Upper Merrion St., Dublin, Ireland.
HENRY SEWILL,	40 Wimpole St., London, England.
†B. A. MUCKENFUSS,	364 King St., Charleston, South Carolina.
W. E. MAGILL,	Erie, Pennsylvania.
C. C. CHITTENDEN,	Madison, Wisconsin.
FRANK ABBOTT,	New York City.
E. A. BOGUE,	New York City.
P. G. C. HUNT,	Indianapolis, Indiana.
J. E. CRAVENS,	Indianapolis, Indiana.
E. H. ANGLE,	Minneapolis, Minnesota.
LUDWIG HOLLÄNDER,	Markt 14, Halle, Germany.
W. CAMPBELL,	27 South Tay St., Dundee, Scotland.
S. B. COOK,	Chattanooga, Tennessee.
†W. T. ARRINGTON,	Memphis, Tennessee.
B. G. MAERCKLEIN,	Milwaukee, Wisconsin.
L. C. INGERSOLL,	Keokuk, Iowa.
WM. TAFT,	Cincinnati, Ohio.
J. HAYHURST,	Lambertville, New Jersey.
*A. O. RAWLS,	Lexington, Kentucky.
J. N. FARRAR,	New York City.
E. T. DARBY,	Philadelphia, Pennsylvania.
G. S. REMBERT,	Natchez, Mississippi.
†LOUIS AUGSPATH,	Little Rock, Arkansas.
W. G. A. BONWILL,	Philadelphia, Pennsylvania.
†T. B. WELCH,	Vineland, New Jersey.

* Deceased.
† Not registered.

Digitized by Google

*GEO. WATT,	Xenia, Ohio.
†O. E. HILL,	Brooklyn, New York.
M. DELAPIERRE,	Petit Rue du Nord 8, Brussels, Belgium.
C. VAN DER HOEVEN,	Haag, Neiderland, Holland.
R. SKOGSBORG,	Stora Wattugatan, Stockholm, Sweden.
JULIUS SCHEFF, JR.,	Hoher Markt 4, Vienna, Austria.
WM. ALFRED HUNT,	Pen Villa Yeovil, Somersetshire, England.
†C. F. RICH,	Saratoga, New York.
WM. EDWARD HARDING,	28 Castle St., Shrewsbury, England.
JAMES LESLIE FRASER,	5 Castle St., Inverness, Scotland.
JULIUS PARREIDT,	Poststrasse 5, Leipzig, Germany.
P. CALAIS,	Hohebleichen 17, Hamburg, Germany.
CARL KAAS,	Universitetsgaten 18, Christiania, Norway.
V. E. TURNER,	Raleigh, North Carolina.
J. J. ANDREW,	2 Belgravia, Belfast, Ireland.

COMMITTEE NO. 1.

GENERAL FINANCE COMMITTEE.

L. D. SHEPARD, *Chairman*,	Boston, Massachusetts.
T. W. BROPHY,	Chicago, Illinois.
A. L. NORTHROP,	New York City.

STATE FINANCE COMMITTEES.

ALABAMA.

†T. B. WHITBY, *Chairman*, Selma.
C. L. BOYD, Eufala. J. A. HALL, Collinsville.
†GEO. EUBANK, Birmingham.

ARIZONA.

L. H. GOODRICH, *Chairman*, Phoenix.

ARKANSAS.

†L. G. ROBERTS, *Chairman*, Eureka Springs.
L. M. WYATT, Bentonville. †L. AUGSPATH, Little Rock.
†A. M. BUCKLEY, Little Rock. †R. W. QUARLES, Van Buren.
†N. N. HAYES, Helena.

* Deceased.
† Not registered.

Digitized by Google

CALIFORNIA.

L. L. DUNBAR, *Chairman*, San Francisco.
JNO. C. MCCOY, Orange. JAS. R. PARKER, Santa Cruz.

CONNECTICUT.

W. H. RIDER, *Chairman*, Danbury.
DANIEL A. JONES, New Haven. †E. PRENTIS, JR., New London.
GEO. L. PARMELE, Hartford

DISTRICT OF COLUMBIA.

H. B. NOBLE, *Chairman*, Washington.

FLORIDA.

L. L. FRINK, *Chairman*, Lake City.

ILLINOIS.

T. W. BROPHY, *Chairman*, Chicago.
H. H. WILSON, Chicago. G. W. ENTSMINGER, Carbondale.
F. H. ZINN, Chicago.

IOWA.

W. H. DEFORD, *Chairman*, Cedar Rapids.
†F. M. BLOOM, *Secretary*, Cedar Rapids.
J. T. ABBOTT, Manchester. †J. A. FLEENER, Oskaloosa.
F. M. SHRIVER, Glenwood. †GUY HUNTLEY, Mason City.
W. H. BAIRD, Burlington. A. C. KELLOGG, Sioux City.
JESSIE M. RITCHEY, Des Moines. T. E. DEVERAUX, Ft. Dodge.

KANSAS.

F. O. HETRICK, *Chairman*, Ottawa.

MAINE.

E. J. ROBERTS, *Chairman*, Augusta.

MARYLAND.

T. S. WATERS, *Chairman*, Baltimore.
†C. M. GINGRICH, *Secretary*, Baltimore.
THOS. H. DAVY, Baltimore. H. G. ULRICH, Baltimore.
†C. E. BUCK, Baltimore, C. E. HARRIS, Baltimore.
FANNIE E. HOOPES, Baltimore. †J. J. WILLIAMS, Baltimore.
†EDWARD NELSON, Frederick. †W. T. KILBY, Easton.

MICHIGAN.

J. WARD HOUSE, *Chairman*, Grand Rapids.
†H. C. CORNS, Detroit. †JOHN L. GISH, Jackson.

MINNESOTA.

†H. M. REID, *Chairman*, Minneapolis.
H. A. KNIGHT, Minneapolis. †H. L. CRUTTENDEN, Northfield.
G. V. I. BROWN, Duluth, J. H. HARRIS, Lake City.
†L. C. DAVENPORT, Moorhead. C. W. MERRY, Stillwater.

† Not registered.

Digitized by Google

†C. H. GOODRICH, St. Paul. †C. H. STEARNS, Zumbrota.
L. W. LYON, St. Paul.

MISSISSIPPI.

†P. H. WRIGHT, *Secretary*, Senatotia.
†W. T. MARTIN, *Treasurer*, Yazoo City.
†A. A. WOFFORD, Columbus. †A. G. TILLMAN, Vicksburg.

MISSOURI.

J. W. WICK, *Chairman*, St. Louis.
A. H. FULLER, St. Louis. J. B. NEWBY, St. Louis.
H. S. LOWRY, Kansas City.

NEBRASKA.

S. R. PATTEN, *Chairman*, Omaha.
F. N. CONNOR, Omaha. †W. C. DAVIS, Lincoln.
W. W. VANCE, Kearney. W. A. IVORY, Wayne.

NEW HAMPSHIRE.

W. R. BLACKSTONE, *Chairman*, Manchester.
†E. B. CUSHING, Laconia. B. C. RUSSELL, Keene.
†GEO. E. BOWERS, Nashua.

NEW JERSEY.

*FRED. A. LEVY, *Chairman*, Orange.
OSCAR ADELBERG, Elizabeth. †THOS. MOORE, Paterson.
†LYMAN CLARK, Rahway. FRED C. BARLOW, Jersey City.
H. A. HULL, New Brunswick. J. N. VANDEWATER, Madison.

NEW YORK.

A. L. NORTHROP, *Chairman*, New York.
F. A. REMINGTON, New York. †A. R. COOKE, Syracuse.
†O. E. HILL, Brooklyn. †FRANK FRENCH, Rochester.
CHAS. K. VANVLECK, Hudson. †CHAS. S. BUTLER, Buffalo.
†F. F. HAWKINS, Troy. †HENRY A. TOMPKINS, Utica.

NORTH CAROLINA.

THOMAS M. HUNTER, *Chairman*, Fayetteville.
†SID. P. HILLIARD, Rocky Mount. J. E. WYCHE, Oxford.
J. W. HUNTER, Salem. †G. W. WHITSETT, Greensboro.

NORTH DAKOTA.

S. P. JOHNSON, *Chairman*, Grand Forks.
†A. HOWE, *Secretary*, Grafton.
†H. L. STARLING, *Treasurer*, Fargo.
E. M. JOHNSTON, Jamestown. W. T. SPRAKE, Casselton.

OKLAHOMA TERRITORY.

————, *Chairman*, Oklahoma City.
†D. A. PEOPLES, Guthrie. †W. R. SHELDON, Edmond.
†L. L. MILES, Kingfisher. †J. ELLARD, Norman.

* Deceased.
† Not registered.

Digitized by Google

PENNSYLVANIA.

J. D. THOMAS, *Chairman*, Philadelphia.

SOUTH CAROLINA.

LOUIS P. DOTTERER, *Chairman*, Charleston.
J. T. CALVERT, Spartansburg. †H. J. RAY, Aiken.
I. SIMPSON, Rock Hill. †L. S. WOLFE, Orangeburg.
BROOKS RUTLEDGE, Florence. G. F. S. WRIGHT, Georgetown.
B. J. QUATTLEBAUM, Winnsboro.

SOUTH DAKOTA.

†W. H. H. BARKER, *Chairman*, Miller.
†W. H. BROWN, Yorkton. †F. O. SALE, Huron.

TENNESSEE.

R. R. FREEMAN, *Chairman*, Nashville.
†E. F. HICKMAN, *Secretary*, Nashville.
†A. F. CLAYWELL, Lebanon. U. D. BILLMEIER, Chattanooga.
†E. G. GRANT, Columbia. †B. S. BYRNES, Memphis.
W. W. JONES, Murfreesboro. †J. M. GLENN, Trenton.
†E. T. JONES, Bristol. †SOUTHALL DICKSON, Bolivar.
†B. D. BRABSON, Knoxville. W. B. SPENCER, Jackson.
†G. W. DAY, Cleveland.

TEXAS.

†GEO. S. STAPLES, *Chairman*, Sherman.
†THOMAS ROBINSON, Houston. †F. H. BROWN, Abilene.
†A. A. BEVILLE, Waco. †SAMUEL DUFF, Greenville.
O. B. LOVE, San Antonio. J. H. VAUGHN, Seguin.
A. A. DYER, Galveston. †S. P. TURNER, Belton.
†J. H. GRANT, Palestine. †R. P. HARWILL, Marshall.
A. J. LAWRENCE, Fort Worth. †T. C. EDWARDS, Gainesville.
†J. P. WILLIAMS, Belleville. †J. G. FIFE, Dallas.
S. W. JOHNSON, Llano. †R. W. CARROLL, Beaumont.

VERMONT.

†J. L. PERKINS, *Chairman*, St. Johnsbury.
JAMES LEWIS, Burlington. W. H. WRIGHT, Brandon.
†R. M. CHASE, Bethel. †A. J. BARKER, Bellows Falls.

WASHINGTON.

P. H. CARLYLE, *Chairman*, Olympia.
†G. B. HAYES, Tacoma. †B. S. SCOTT, Ellensburgh.
†G. W. PRICE, Seattle. C. A. DARLING, New Whatcom.
†W. A. WRIGHT, Spokane.

† Not registered.

Digitized by Google

COMMITTEE NO. 2.

PROGRAMME COMMITTEE.

C. N. JOHNSON, *Chairman*,	Chicago, Illinois.
J. A. DUNN,	Chicago, Illinois.
†GEO. EUBANK,	Birmingham, Alabama.
J. W. WASSALL,	Chicago, Illinois.
GEO. HARDY,	Baltimore, Maryland.
LOUIS OTTOFY,	Chicago, Illinois.
L. P. BETHEL,	Kent, Ohio.

COMMITTEE NO. 3.

COMMITTEE ON EXHIBITS.

CHAS. P. PRUYN, *Chairman*,	Chicago, Illinois.
ARTHUR E. MATTESON,	Chicago, Illinois.
E. M. S. FERNANDEZ,	Chicago, Illinois.
M. L. RHEIN,	New York City.
A. W. MCCANDLESS,	Chicago, Illinois.
R. C. YOUNG,	Anniston, Alabama.
JAMES CHACE,	Ocala, Florida.
W. A. CAMPBELL,	Brooklyn, New York.

COMMITTEE NO. 4.

COMMITTEE ON TRANSPORTATION.

F. H. GARDINER, *Chairman*,	Chicago, Illinois.
V. H. JACKSON,	New York City.
†GEO. EUBANK,	Birmingham, Alabama.
JOHN E. STOREY,	Dallas, Texas.
†H. A. FYNN,	Denver, Colorado.

COMMITTEE NO. 5.

COMMITTEE ON RECEPTION.

J. A. SWASEY, *Chairman*,	Chicago, Illinois.
*W. W. ALLPORT,	Chicago, Illinois.
A. O. HUNT,	Iowa City, Iowa.
W. W. H. THACKSTON,	Farmville, Virginia.

* Deceased.
† Not registered.

Digitized by Google

E. M. S. FERNANDEZ,	Chicago Illinois.
GEO. A. CHRISTMANN,	Chicago, Illinois.
JAMES MCMANUS,	Hartford, Connecticut.
A. W. HARLAN,	Chicago, Illinois.
JOHN D. THOMAS,	Philadelphia, Pennsylvania.
H. J. MCKELLOPS,	St. Louis, Missouri.
L. L. DUNBAR,	San Francisco, California.
V. E. TURNER,	Raleigh, North Carolina.
JOSEPH BAUER,	New Orleans, Louisiana.
†J. F. P. HODSON,	New York City.
W. P. DICKINSON,	Minneapolis, Minnesota.
C. F. W. HOLBROOK,	Newark, New Jersey.
W. G. FOSTER,	Baltimore, Maryland.
R. M. SANGER,	East Orange, New Jersey.
E. D. SWAIN,	Chicago, Illinois.
M. V. TOLEDO,	New York City.
JOHN S. MARSHALL,	Chicago, Illinois.
A. F. EMMINGER,	Columbus, Ohio.
T. L. GILMER,	Chicago, Illinois.
H. J. BURKHARDT,	Batavia, New York.
J. W. TAYLOR,	New York City.
GEO. L. FIELD,	Detroit, Michigan.
†F. E. HOWARD,	Buffalo, New York.
A. H. FULLER,	St. Louis, Missouri.
†H. W. SHRIVER,	Omaha, Nebraska.
†R. K. LUCKIE,	Holly Springs, Mississippi.
†C. S. SEARLES,	Dubuque, Iowa.
L. D. SHEPARD,	Boston, Massachusetts.
J. P. GERAN,	Brooklyn, New York.
THOS. E. WEEKS,	Minneapolis. Minnesota.
CHAS. H. DARBY,	St. Joseph, Missouri.
W. W. WALKER,	New York City.

COMMITTEE NO. 6.

COMMITTEE ON REGISTRATION.

G. CARLETON BROWN, *Chairman*,	Elizabeth, New Jersey.
E. L. CLIFFORD,	Chicago, Illinois.
GEO. N. WEST,	Chicago, Illinois.
J. Y. CRAWFORD,	Nashville, Tennessee.
T. L. JAMES,	Fairfield, Iowa.
W. H. FUNDENBURGH,	Pittsburg, Pennsylvania.
†W. W. HILL,	Washington, Georgia.

† Not registered.

Digitized by Google

†CHAS. L. DUBAR,	New York City.
S. W. FOSTER,	Decatur, Alabama.
H. N. YOUNG,	Wilkesbarre, Pennsylvania.
M. V. TOLEDO,	New York, New York.
*FRED A. LEVY,	Orange, New Jersey.

COMMITTEE No. 7.

COMMITTEE ON PRINTING TRANSACTIONS.

A. W. HARLAN, *Chairman*,	Chicago, Illinois.
A. O. HUNT,	Iowa City, Iowa.
LOUIS OTTOFY,	Chicago, Illinois.

COMMITTEE No. 8.

COMMITTEE ON CONFERENCE WITH STATE AND LOCAL SOCIETIES.

J. TAFT, *Chairman*, Cincinnati, Ohio.

STATE CONFERENCE COMMITTEES.

ALABAMA.

E. S. CHISHOLM, *Chairman*, Tuscaloosa.
CLARENCE P. ROBINSON, *Secretary*, Mobile.
A. EUBANK, Birmingham. †G. M. ROUSSEAU, Montgomery.

ARIZONA.

L. H. GOODRICH, *Chairman*, Phoenix.
†J. HARDY, *Secretary*, Phoenix.
†D. PENTLAND, Prescott. W. WARNEKROS, Tombstone.

ARKANSAS.

M. C. MARSHALL, *Chairman*, Little Rock.
†W. B. POLLARD, Hot Springs. †R. D. SEALS, Fort Smith.
L. K. LAND, Pine Bluff. †A. E. KIMMONS, Fort Smith.

CALIFORNIA.

C. L. GODDARD, *Chairman*, San Francisco.
W. J. YOUNGER, San Francisco. E. L. TOWNSEND, Los Angeles.

COLORADO.

W. E. GRISWOLD, Denver.

* Deceased.
† Not registered.

Digitized by Google

CONNECTICUT.

E. S. GAYLORD, *Chairman*, New Haven.
JAS. MCMANUS, Hartford. †R. W. BROWNE, New London.

DELAWARE.

C. H. GILPIN, *Chairman*, Middletown.
C. R. JEFFERIS, Wilmington.

DISTRICT OF COLUMBIA.

HENRY C. THOMPSON, *Chairman*, Washington.
†R. B. DONALDSON, Washington. L. C. F. HUGO, Washington.
J. HALL LEWIS, Washington.

FLORIDA.

†J. N. JONES, *Chairman*, Jacksonville.
†JAMES CHACE, Ocala. †I. J. WELCH, Pensacola.
†DUFF POST, Tampa.

GEORGIA.

†S. B. BARFIELD, *Chairman*, Macon.
H. H. JOHNSON, *Secretary*, Macon.
†JOHN H. COYLE, Thomasville. *W. C. WARDLAW, Augusta.

IDAHO.

†J. H. MCCALLIE, *Chairman*, Moscow.
†S. A. MULKEY, Moscow. A. BOSTON, Lewiston.
†T. B. MCBRIDE, Moscow.

ILLINOIS.

JAMES W. CORMANY, *Chairman*, Mt. Carroll.
W. H. TAGGART, Chicago. †J. J. JENNELLE, Cairo.
C. N. JOHNSON, Chicago.

INDIANA.

S. B. BROWN, *Chairman*, Fort Wayne.
J. E. CRAVENS, *Secretary*, Indianapolis.
†E. J. CHURCH, La Porte. THOS. S. HACKER, Indianapolis.
†J. W. JAY, Richmond. P. G. C. HUNT, Indianapolis.
R. W. VAN VALZAH, Terre Haute.

IOWA.

†C. J. PETERSON, *Chairman*, Dubuque.
L. K. FULLERTON, *Secretary*, Waterloo.
†S. C. HATCH, Sioux City.

KANSAS.

L. C. WASSON, *Chairman*, Topeka.
C. E. ESTERLY, Lawrence. WM. H. SCHULZE, Atchison.

KENTUCKY.

C. G. EDWARDS, *Chairman*, Louisville.
†CHAS. E. DUNN, Louisville. F. PEABODY, Louisville.

* Deceased.
† Not registered.

Digitized by Google

LOUISIANA.

†D. D. McKITRICK, *Chairman*, Baton Rouge.
JOSEPH BAUER, New Orleans.

MAINE.

D. W. FELLOWS, *Chairman*, Portland.
†EDMUND C. BRYANT, Pittsfield. HENRY A. KELLY, Portland.

MARYLAND.

E. P. KEECH, *Chairman*, Baltimore.
A. J. VOLCK, Baltimore. †EDWARD NELSON, Frederick.

MASSACHUSETTS.

D. M. CLAPP, *Chairman*, Boston.
EUGENE H. SMITH, Boston. D. B. INGALLS, Clinton.
S. G. STEVENS, Boston. R. R. ANDREWS, Cambridge.
L. D. SHEPARD, Boston. GEO. A. MAXFIELD, Holyoke.
JAMES H. DALY, Boston.

MICHIGAN.

C. S. CASE, *Chairman*, Jackson.
GEO. L. FIELD, Detroit. †F. L. OWEN, Grand Rapids.

MINNESOTA.

T. E. WEEKS, *Chairman*, Minneapolis.
†M. G. JENISON, Minneapolis. C. H. ROBINSON, Wabasha.

MISSISSIPPI.

†MORGAN ADAMS, *Chairman*, Sardis.
W. E. WALKER, *Secretary*, Bay St. Louis.
R. K. LUCKIE, Holly Springs. G. B. CLEMENTS, Macon.
†J. D. MILES, Vicksburg.

MISSOURI.

C. L. HUNGERFORD, *Chairman*, Kansas City.
A. H. FULLER, St. Louis. J. D. PATTERSON, Kansas City.

MONTANA.

†C. S. WHITNEY, Miles City.

NEBRASKA.

H. T. KING, *Chairman*, Fremont.
A. W. NASON, Omaha. H. J. COLE, Norfolk.
†H. C. MILLER, Grand Island. †I. W. FUNCK, Beatrice.

NEVADA.

A. CHAPMAN, *Chairman*, Virginia City.
†M. A. GREENLAW, Reno. †S. S. SOUTHWORTH, Carson City.

NEW HAMPSHIRE.

†C. W. CLEMENTS, *Chairman*, Manchester.
†G. A. YOUNG, Concord. C. H. HAYWARD, Peterboro.

† Not registered.

Digitized by Google

†WM. JARVIS, Claremont. B. C. RUSSELL, Keene.
†W. R. BLACKSTONE, Manchester.

NEW JERSEY.

S. C. G. WATKINS, *Chairman*, Montclair
B. F. LUCKEY, Paterson. CHAS. A. MEEKER, Newark.
R. M. SANGER, East Orange.

NEW YORK.

JOHN I. HART, *Chairman*, New York.
K. C. GIBSON, New York. CHAS. S. BUTLER, Buffalo.
W. CARR, New York. F. A. REMINGTON, New York.
M. L. RHEIN, New York. †F. C. WALKER, Brooklyn.

NORTH CAROLINA.

V. E. TURNER, *Chairman*, Raleigh.
J. F. GRIFFITH, *Secretary*, Salisbury.
†J. H. DURHAM, Wilmington.

NORTH DAKOTA.

S. J. HILL, *Chairman*, Fargo.
†E. M. PIERCE, *Secretary*, Hillsboro.
S. P. JOHNSON, Grand Forks. †H. S. SOWLES, Wahpeton.
†W. O. DEPUY, Bismarck.

OHIO.

J. R. CALLAHAN, *Chairman*, Cincinnati.
H. F. HARVEY, Cleveland. A. F. EMMINGER, Columbus.
M. H. FLETCHER, Cincinnati. C. H. HARROUN, Toledo.
L. E. CUSTER, Dayton.

OKLAHOMA TERRITORY.

†D. A. PEOPLES, *Chairman*, Guthrie.
†J. S. NICHOLSON, El Reno.

OREGON.

†S. J. BARBER, *Chairman*, Portland.
†E. G. CLARK, *Secretary*, Portland.
†J. R. CARDWELL, Portland.

PENNSYLVANIA.

L. A. FAUGHT, *Chairman*, Philadelphia.
†J. A. LIBBEY, *Secretary*, Pittsburg.
†C. S. BECK, Wilkesbarre.

SOUTH CAROLINA.

THOS. T. MOORE, *Chairman*, Columbia.
W. S. BROWN, Charleston. †B. H. TEAGUE, Aiken.
†A. P. JOHNSTONE, Anderson.

SOUTH DAKOTA.

O. M. HUESTIS, *Chairman*, Aberdeen.
†C. W. STUTENROTH, Watertown. †F. W. BLOMILEY, Sioux Falls.

† Not registered.

Digitized by Google

TENNESSEE.

H. W. MORGAN, *Chairman*, Nashville.
†B. S. BYRNES, Memphis. S. B. COOK, Chattanooga.
W. H. RICHARDS, Knoxville. H. E. BEACH. Clarksville.

TEXAS.

W. R. CLIFTON, *Chairman*, Waco.
†G. M. PATTEN, Galveston. †T. L. WESTERFIELD, Dallas.
†TOM ROBINSON, Houston. †H. J. MCBRIDE, Tyler.

UTAH.

†A. S. CHAPMAN, *Chairman*, Salt Lake City.
†A. B. DUNFORD, Salt Lake. †F. W. BAKER, Ogden.

VERMONT.

G. F. CHENEY, *Chairman*, St. Johnsbury.
†R. M. CHASE, Bethel.

VIRGINIA.

†J. HALL MOORE, *Chairman*, Richmond.
W. W. H. THACKSTON, Farmville. E. P. BEADLES, Danville.
JOS. R. WOODLEY, Norfolk. †T. H. PARRAMORE, Hampton.
D. W. RUST, Alexander.

WASHINGTON.

W. E. BURKHART, *Chairman*, Tacoma.
†F. P. HICKS, Tacoma. *J. C. GRASSE, Seattle.

WEST VIRGINIA.

†H. H. HARRISON, *Chairman*, Wheeling.
†JNO. H. MCCLURE, Wheeling. GEORGE I. KEENER, Grafton.
†J. N. MAHAN, Charleston.

WISCONSIN.

†B. G. MAERCKLEIN, *Chairman*, Milwaukee.
†C. C. CHITTENDEN, Madison.

WYOMING.

†A. F. THODE, *Chairman*, Rawlins.
†W. T. BUCHANAN, Cheyenne.

COMMITTEE NO. 9.

COMMITTEE ON THE HISTORY OF DENTAL LEGISLATION IN THIS AND OTHER COUNTRIES.

WILLIAM CARR, *Chairman*, New York City.
PAUL DUBOIS, 2 Rue d'Amsterdam, Paris, France.

* Deceased.
† Not registered.

Digitized by Google

DR. F. BUSCH,	Alexanderufer 6, N. W., Berlin, Germany.
†C. STODDARD SMITH,	Chicago, Illinois.
S. R. SALAZAR,	Lima, Peru.
*W. F. REHFUSS,	Philadelphia, Pennsylvania.
†G. W. COPP,	Durango, Colorado.
†WALTER S. LEAMING,	Cape May, New Jersey.
†R. A. HOLLIDAY,	Atlanta, Georgia.
THEO. FRICK,	1, Tonhallestrasse, Zürich, Switzerland.

COMMITTEE NO 10.

AUDITING COMMITTEE.

L. D. SHEPARD, *Chairman*,	Boston, Massachusetts.
R. R. ANDREWS,	Cambridge, Massachusetts.
DWIGHT M. CLAPP,	Boston, Massachusetts.

COMMITTEE NO. 11.

COMMITTEE ON INVITATION.

W. C. BARRETT, *Chairman*,	Buffalo, New York.
E. T. DARBY,	Philadelphia, Pennsylvania.
S. G. PERRY,	New York City.
*W. C. WARDLAW,	Augusta, Georgia.
†S. W. DENNIS,	San Francisco, California.
J. D. PATTERSON,	Kansas City, Missouri.
THOS. FILLEBROWN,	Boston, Massachusetts.
THOS. T. MOORE,	Columbia, South Carolina.
†GEO. B. STEEL,	Richmond, Virginia.

COMMITTEE NO. 12.

COMMITTEE ON MEMBERSHIP.

EDMUND NOYES, *Chairman*,	Chicago, Illinois.
B. F. LUCKEY,	Paterson, New Jersey.
E. S. CHISHOLM,	Tuscaloosa, Alabama.
C. M. BAILEY,	Minneapolis, Minnesota.
DANIEL N. MCQUILLEN,	Philadelphia, Pennsylvania.
E. L. TOWNSEND,	Los Angeles, California.
†C. E. HUSSEY,	Biddeford, Maine.
†J. J. PITTS,	Brooklyn, New York.
J. FRANK MARINER,	Chicago, Illinois.

* Deceased.
† Not registered

Digitized by Google

COMMITTEE No. 13.

COMMITTEE ON EDUCATIONAL AND LITERARY EXHIBITS.

J. J. R. PATRICK, *Chairman.*	Belleville, Illinois.
J. Y. CRAWFORD,	Nashville, Tennessee.
A. H. FULLER,	St. Louis, Missouri.
C. A. BRACKETT,	Newport, Rhode Island.
†D. M. SABATER,	New York City.
†H. G. MIRICK,	Brooklyn, New York.

COMMITTEE No. 14.

COMMITTEE ON CLINICS IN OPERATIVE DENTISTRY AND ORAL SURGERY.

C. F. W. BÖDECKER, *Chairman*,	New York City.
JOHN S. MARSHALL, *Vice-Ch'man*,	Chicago, Illinois.
ARTHUR B. FREEMAN,	Chicago, Illinois.
HENRY W. MORGAN,	Nashville, Tennessee.
†WILLIAM CRENSHAW,	Atlanta, Georgia.
T. L. GILMER,	Chicago, Illinois.
S. C. G. WATKINS,	Montclair, New Jersey.
C. A. SOUTHWELL,	Milwaukee, Wisconsin.
G. C. DABOLL,	14 Avenue de l'Opera, Paris, France.
M. C. GOTTSCHALDT,	New York City.
R. HEIDE,	3 Rue d'Argenteuil, Paris, France.
H. H. SCHUHMANN,	Chicago, Illinois.
J. G. REID,	Chicago, Illinois.
B. D. WIKOFF,	Chicago, Illinois.
F. T. BREENE,	Iowa City, Iowa.
N. S. HOFF,	Ann Arbor, Michigan.
†J. H. GASKILL.	Philadelphia, Pennsylvania.
†J. M. NORMAN,	Denver, Colorado.
†JAMES GOODWILLIE,	New York City.
G. V. I. BROWN,	Duluth, Minnesota.

COMMITTEE No. 15.

COMMITTEE ON PROSTHETIC DENTISTRY.

S. H. GUILFORD, *Chairman*,	Philadelphia, Pennsylvania.
L. P. HASKELL,	Chicago, Illinois.
†A. P. JOHNSTONE,	Anderson, South Carolina.

† Not registered.

Digitized by Google

W. N. MORRISON,	St. Louis, Missouri.
FRED. C. BARLOW,	Jersey City, New Jersey.
J. HALL LEWIS,	Washington, D. C.
A. O. HUNT,	Iowa City, Iowa.
R. R. FREEMAN,	Nashville, Tennessee.
E. S. GAYLORD,	New Haven, Connecticut.
HARRY ROSE,	59 Queen Anne St., Cavendish Square, London, England.
F. H. BALKWILL,	3 Princess Square, Plymouth, England.
J. R. KNAPP,	New Orleans, Louisiana.
C. M. RICHMOND,	New York City.
W. V. B. AMES,	Chicago, Illinois.
G. MOLYNEAUX,	Cincinnati, Ohio.
†C. V. ROSSER,	Atlanta, Georgia.
JOHN S. THOMPSON,	Atlanta, Georgia.
F. M. SHRIVER,	Glenwood, Iowa.
M. A. BARTLESON,	Denver, Colorado.
†C. H. DARBY,	St. Joseph, Missouri.
W. H. COFFIN,	94 Cornwall Gardens, S. Kensington, London, England.
W. MITCHELL,	39 Upper Brook St., London, England.
R. G. RICHTER,	Milwaukee, Wisconsin.
GEO. W. MELOTTE,	Ithaca, New York.

COMMITTEE No. 16.

LOCAL COMMITTEE OF ARRANGEMENTS.

F. H. GARDINER, *Chairman*,	Chicago, Illinois.
C. N. JOHNSON,	Chicago, Illinois.
D. B. FREEMAN,	Chicago, Illinois.
H. J. MCKELLOPS,	St. Louis, Missouri.
L. L. DAVIS,	Chicago, Illinois.
P. J. KESTER,	Chicago, Illinois.

COMMITTEE No. 17.

COMMITTEE ON ESSAYS.

E. C. KIRK, *Chairman*,	Philadelphia, Pennsylvania.
J. W. WASSALL,	Chicago, Illinois.
A. H. THOMPSON,	Topeka, Kansas.
H. H. JOHNSON,	Macon, Georgia.
L. G. NOEL,	Nashville, Tennessee.
C. N. PEIRCE,	Philadelphia, Pennsylvania.

† Not registered.

Digitized by Google

COMMITTEE NO. 18.

COMMITTEE ON THE HISTORY OF DENTISTRY IN THE UNITED STATES.

J. TAFT, *Chairman*,	Cincinnati, Ohio.
LOUIS JACK,	Philadelphia, Pennsylvania.
F. T. VAN WOERT,	Brooklyn, New York.
F. J. S. GORGAS,	Baltimore, Maryland.
H. L. MCKELLOPS,	San Francisco, California.
†E. G. BETTY,	Cincinnati, Ohio.
†J. B. PATRICK,	Charleston, South Carolina.
J. HAYHURST,	Lambertville, New Jersey.
†F. H. SUTHERLAND,	Pueblo, Colorado.

COMMITTEE NO. 19.

COMMITTEE ON NOMENCLATURE.

G. V. BLACK, *Chairman*,	Jacksonville, Illinois.
E. C. KIRK,	Philadelphia, Pennsylvania.
W. O. KULP,	Davenport, Iowa.
J. EDWIN LINE,	Rochester, New York.
†J. B. HODGKIN,	Washington, D. C.
J. S. CASSIDY,	Covington, Kentucky.
†C. T. STOCKWELL,	Springfield, Massachusetts.
A. WITZEL,	Hochstrasse 1, Essen, Germany.
E. RICHTER,	Chausseestrasse 1 a, N., Berlin, Germany.
J. v. METNITZ,	Am Hoff 11, Vienna, Austria
O. ROSENTHAL,	Liege, Belgium.
P. SIDNEY SPOKES,	59 Queen Anne St., Cavendish Square, London, W., England.
E. DAMAIN,	10 Rue Vivienne, Paris, France.
H. J. BILLETER,	Weinplatz 3, Zürich, Switzerland.
O. AMEODO,	15 Avenue de l'Opera, Paris, France.
A. C. HUGENSCHMIDT,	23 Boulevard Malesherbes, Paris, France.

COMMITTEE NO. 20.

COMMITTEE TO PROMOTE THE APPOINTMENT OF DENTAL SURGEONS IN THE ARMIES AND NAVIES OF THE WORLD.

M. W. FOSTER, *Chairman*,	Baltimore, Maryland.
B. HOLLY SMITH,	Baltimore, Maryland.
GEO. CUNNINGHAM,	2 King's Parade, Cambridge, England.

† Not registered.

Digitized by Google

ADOLPH WEIL,	Amelienstrasse 3, Munich, Germany.
JNO. E. GREVERS,	Oude Turfmarkt 13, Amsterdam, Holland.
E. DETREY,	Vevey, Switzerland.
O. ZSIGMONDY,	Reichsrathplatz 2, Vienna, Austria.
ANTONIO DAMIANO MELA,	Salita Santa Canterino I, Genoa, Italy.
V. HADERUP,	Copenhagen, Denmark.
A. J. CHRUSTCHOW,	Newsky 45, St. Petersburg, Russia.
ALEX. MCG. DENHAM,	Calle Monjitas 68¾, Santiago de Chili.
GEO. B. NEWLAND,	107 Calle Florida, Buenos Ayres, South America.
FRANK WOODBURY,	137 Hollis St., Halifax, Nova Scotia.
A. H. BROCKWAY,	Brooklyn, New York.
WM. CONRAD,	St. Louis, Missouri.

COMMITTEE NO. 21.

COMMITTEE ON THE CARE OF THE TEETH OF THE POOR.

T. H. PARRAMORE, *Chairman*,	Hampton, Virginia.
W. J. BARTON,	Paris, Texas.
C. A. BRACKETT,	Newport, Rhode Island.
†T. D. INGERSOLL,	Erie, Pennsylvania.
W. M. FISHER,	136 Nethergate, Dundee, Scotland.
†M. V. JOHNSON,	Holden, Missouri.
†J. ALLEN OSMUN,	Newark, New Jersey.
C. S. BUTLER,	Buffalo, New York.
†GEO. E. ADAMS,	South Orange, New Jersey.
H. M. SMITH,	Colorado Springs, Colorado.

COMMITTEE NO. 22.

COMMITTEE ON BIOLOGY AND BACTERIOLOGY.

R. R. ANDREWS, *Chairman*,	Cambridge, Massachusetts.
†M. H. FLETCHER,	Cincinnati, Ohio.
W. X. SUDDUTH,	Minneapolis, Minnesota.
W. D. MILLER,	W. Lennestrasse 3, Berlin, Germany.
D. E. CAUSH,	63 Grand Parade, Brighton, England.
M. MORGENSTERN,	Kreuzstrasse 10, Baden Baden, Ger.
GEO. S. ALLAN,	New York City.
G. V. BLACK,	Jacksonville, Illinois.
RICHARD CHAUVIN,	72 Rue Lafayette, Paris, France.
H. E. MASCORT,	15 Avenue de l'Opera, Paris, France.

† Not registered.

Digitized by Google

COMMITTEE No. 23.

COMMITTEE ON PRIZE ESSAYS.

THEO. STANLEY, *Chairman*,	Kansas City, Missouri.
C. S. STOCKTON,	Newark, New Jersey.
E. P. KEECH,	Baltimore, Maryland.
OTTO ARNOLD,	Columbus, Ohio.
C. B. ROHLAND,	Alton, Illinois.

COMMITTEE No. 24.

EDITORIAL COMMITTEE.

W. W. WALLER, *Chairman*,	New York City.
A. O. HUNT,	Iowa City, Iowa.
L. D. SHEPARD,	Boston, Massachusetts.
J. TAFT,	Cincinnati, Ohio.
J. S. MARSHALL,	Chicago, Illinois.
A. W. HARLAN,	Chicago, Illinois.

COMMITTEE No. 25.

NOMINATING COMMITTEE.

W. W. WALKER, *Chairman*,	New York City.
A. W. HARLAN,	Chicago, Illinois.
J. C. STOREY,	Dallas, Texas.

Digitized by Google

OFFICERS OF THE SECTIONS.

"SCIENCE."

DEPARTMENT "A."

SECTION 1.

ANATOMY AND HISTOLOGY.

Chairman.—R. R. ANDREWS,	Cambridge, Massachusetts.
Vice-Chairman.—E. P. BEADLES,	Danville, Virginia.
Secretary.—F. T. BREENE,	Iowa City, Iowa.

SECTION 2.

ETIOLOGY, PATHOLOGY AND BACTERIOLOGY.

Chairman.—G. V. BLACK,	Jacksonville, Illinois.
Vice-Chairman.—GEO. S. ALLAN,	New York City.
Secretary.—E. S. CHISHOLM,	Tuscaloosa, Alabama.

SECTION 3.

CHEMISTRY AND METALLURGY.

Chairman.—D. R. STUBBLEFIELD,	Nashville, Tennessee.
Vice-Chairman.—J. S. CASSIDY,	Covington, Kentucky.
Secretary.—E. V. MCLEOD,	New Bedford, Massachusetts.

SECTION 4.

THERAPEUTICS AND MATERIA MEDICA.

Chairman.—F. J. S. GORGAS,	Baltimore, Maryland.
Vice-Chairman.—N. S. HOFF,	Ann Arbor, Michigan.
Secretary.—GEO. E. HUNT,	Indianapolis, Indiana.

"APPLIED SCIENCE."

DEPARTMENT "B."

SECTION 5.

DENTAL AND ORAL SURGERY.

Chairman.—T. W. BROPHY,	Chicago, Illinois.
Vice-Chairman.—M. H. CRYER,	Philadelphia, Pennsylvania.
Secretary.—*W. C. WARDLAW,	Atlanta, Georgia.

* Deceased.

Digitized by Google

SECTION 6.

OPERATIVE DENTISTRY.

Chairman.—WM. JARVIE, Brooklyn, New York.
Vice-Chairman.—DAN'L N. MCQUILLEN, Philadelphia, Pennsylvania.
Secretary.—HENRY W. MORGAN, Nashville, Tennessee.

SECTION 7.

PROSTHESIS AND ORTHODONTIA.

Chairman.—C. L. GODDARD, San Francisco, California.
Vice-Chairman.—T. S. HACKER, Indianapolis, Indiana.
Secretary.—R. T. OLIVER, Indianapolis, Indiana.

SECTION 8.

EDUCATION, LEGISLATION AND LITERATURE.

Chairman.—J. J. R. PATRICK, Belleville, Illinois.
Vice-Chairman.—H. L. MCKELLOPS, San Francisco, California.
Secretary.—W. H. WHITSLAR, Cleveland, Ohio.

Digitized by Google

GENERAL SESSIONS.

Digitized by Google

Digitized by Google

GENERAL SESSIONS.

FIRST DAY, MONDAY, AUGUST 14.

The session was called to order at 11 A. M. by the Hon. C. C. Bonney, President of the World's Congress Auxiliary.

Dr. J. Taft of Cincinnati, O., invoked the divine blessing upon the deliberations of the Congress.

ADDRESS OF PRESIDENT BONNEY.

Officers and Members of the World's Columbian Dental Congress,

LADIES AND GENTLEMEN: The science and practice of the art of dentistry most conspicuously represents one of the most important movements of the age, the specialization of scientific pursuits. The old fields of research and application were so narrow that they were readily mastered by the learner and practitioner, who scarcely realized, indeed, the importance and the magnitude of the different branches to which, as occasion required, he turned his half-trained hand. All this has been changed by the marvelous developments of modern civilization. The horizon of scientific attainment has been lifted and extended, until only a powerful glass can trace its outlines. In the swiftly developing evolution of arts and sciences, the great work of logical and orderly differentiation has gone forward, subdividing the professional and other pursuits, until now he who would command the confidence of his brethren and the public must have more than a general knowledge of the department in which he is engaged. That, indeed, is indispensable, but it is not enough. The general physician and surgeon cannot be

Digitized by Google

trusted to deal with the exact mechanism of the eye or ear, or with the important and delicate relations of the teeth, for a lifetime may be spent and the highest abilities and attainments be exercised in either field. The old-fashioned tooth carpenter, with his entirely appropriate name, has, like the dodo, become an extinct species, and in his place we find the modern doctor of dental surgery, accomplished, learned and skilled, familiar with anatomy, histology, etiology, pathology, bacteriology, chemistry and metallurgy, as well as with the practical operations of his art.

In welcoming you to this Congress, I congratulate you upon the admirable programme prepared by the committees of organization and upon the international character of the papers to be presented. Germany, Austria, Scotland, Roumania, Greece, Finland, Norway, England and other countries unite with the American states in this Congress. May it realize your highest expectations and be fruitful of the most satisfactory results.

The realization of the organization by which this Congress has been constituted is represented on this occasion by Dr. W. W. Walker, its chairman, who will now be presented to you as representing not only this general committee, but the committee of the World's Congress Auxiliary, with whose co-operation the Congress has been constituted. I have the pleasure of presenting to you Dr. Walker.

DR. W. W. WALKER.

President Bonney, Members of the World's Columbian Dental Congress,

LADIES AND GENTLEMEN: After the very flattering remarks and most cordial welcome of our worthy friend, the President of the World's Congress Auxiliary, the Hon. C. C. Bonney, and the time having arrived for the opening of the World's Columbian Dental Congress, it is hardly necessary for me at this time to recapitulate that which has so often been placed before the reputable dentists of the world by this Executive Committee in circular letters,

Digitized by Google

through dental journals and other dental literature, as to how the World's Columbian Dental Congress was born and organized—suffice it to say that by joint resolution of the two foremost dental organizations of America—the Southern Dental Association and the American Dental Association—this Executive Committee of fifteen was instructed to organize a Dental Congress in this city, and at this time, and their action should be final.

We, as an Executive Committee, have done only that which was considered our duty. We have laid aside all personal feeling, if any ever existed; we have buckled on the armor of true manhood—working hand in hand and shoulder to shoulder to accomplish for our chosen profession that which places it where it so justly and proudly belongs —in the front rank of scientific bodies of the world.

Having thus performed that duty, overcoming the many obstacles that were before us, with the assistance of those who have been working with us, we can truly say, in the vocabulary of the dentist who is always working for the advancement and elevation of his chosen profession, that there is no such word as "fail," and as a recompense for the work we have done, all we ask is that the members of the two organizations and the members of this Congress, who placed us in this position, shall say: "Well done, good and faithful servants."

I have now the honor of introducing to you the President of the World's Columbian Dental Congress, Dr. L. D. Shepard, of Boston, Mass.

PRESIDENT SHEPARD. No extended words are expected from me at this time. I will call upon Dr. Walker to proceed with the introduction of the other officers of the Congress.

DR. WALKER. I now have the pleasure of introducing the vice-presidents of the World's Columbian Dental Congress: Dr. W. W. H. Thackston, of Farmville, Va.; Dr. W. H. Morgan, of Nashville, Tenn.; Dr. A. L. Northrop, of New York City; Dr. J. Taft, of Cincinnati, Ohio;

Digitized by Google

Dr. Louis W. Lyon, of St. Paul, Minnesota; Dr. W. O. Kulp, of Davenport, Ia.; Dr. C. S. Stockton, of Newark, N. J.; Dr. E. T. Darby, of Philadelphia, Pa.; Dr. H. J. McKellops, of St. Louis, Mo.; Dr. J. H. Hatch, of San Francisco, Cal.; Dr. J. B. Patrick, of Charleston, S. C.; Dr. John C. Storey, of Dallas, Tex.; the Secretary-General of the Congress, Dr. A. W. Harlan, of Chicago; the Assistant Secretaries, Drs. Joseph Bauer, of New Orleans, La.; E. M. S. Fernandez, Louis Ottofy, of Chicago, and W. C. Wardlaw, of Atlanta, Ga.; the Treasurer, Dr. J. S. Marshall, of Chicago, and the Secretary of the General Executive Committee, Dr. A. O. Hunt, of Iowa City, Iowa.

Dr. Walker then formally introduced the members of the Executive Committee and of the general committee of the World's Congress Auxiliary, and also the committee of the Woman's Branch, by name.

THE PRESIDENT. We will now listen to the reading of the resolutions creating the Congress, by the Secretary-General, Dr. A. W. Harlan.

Dr. Harlan read the resolutions, as follows:

WHEREAS, There is to be a World's Columbian Exposition in Chicago in 1893; and

WHEREAS, In consequence of the fact that the choicest products of the world are there to be displayed, it is expected that citizens in large numbers of all civilized countries will be gathered together there for the purpose of seeing these exhibits; and

WHEREAS, It is to be presumed that many dentists from foreign countries will visit the United States at that time; and

WHEREAS, The time of the Exposition will be an opportune occasion for a great meeting of the dentists of the world; and

WHEREAS, It is believed that a great advance in science and the practice of dental and oral surgery would result

Digitized by Google

from a meeting of the dentists of the United States with those from foreign countries, who might then be visiting in this country; and

WHEREAS, It is desirable that any meeting then held should be at the instance of the American Dental Association and the Southern Dental Association and organized by a joint committee by them appointed; therefore, be it

Resolved, That the president of this Southern Dental Association appoint a committee of five to confer with a like committee that may be appointed at the next meeting of the American Dental Association upon this subject, and that this joint committee have power to fill all vacancies, and shall add to its membership either one, three or five more members, as it may deem advisable, and when this committee is so completed it shall be clothed with full power to take such action as in its judgment it may deem best for creating an organization for the purpose of holding a Dental Congress in the city of Chicago in 1893, which the reputable dentists throughout the world shall be invited to attend, and that any action that this committee may take in the premises shall be final and binding.

THE PRESIDENT. The Hon. John Temple Graves, of Georgia, accepted an invitation to address the Congress upon the needs of dentistry from the public standpoint. A dispatch has been received from him that while his address is all written, he is detained by illness from coming here to deliver it. The executive committee have invited one of their number, Dr. J. Y. Crawford, to take his place, and we now welcome him as a substitute for Mr. Graves.

DR. CRAWFORD. *Mr. President of the World's Columbian Dental Congress, Ladies and Gentlemen:* You will excuse me for saying that I am much embarrassed at being called upon at this late hour to make the address of welcome, in the room and in the stead of the distinguished orator from Georgia, the Hon. John Temple Graves. I am further embarrassed from the fact that I am to stand here as the mouthpiece, not only of the

Digitized by Google

dental profession of the United States, but as the mouthpiece of the whole people composing the American Union. Quite seventy million of hearts to-day are expressing through me their universal welcome to the dentists of the world. How sublime a thought it is that America is now extending through me this hearty welcome, and saying to you, "Be with us and among us, and assist us in furthering the grand work of the dental profession." I am additionally embarrassed from the fact that I welcome you here to-day for the purpose of discussing the advancement of the beneficent art of dentistry, as it is to-day a question of paramount importance to all other questions. I am sorry that Mr. Graves is not here to discuss the question of dentistry from the standpoint of public necessity. Why do I say that? Because of all questions in the world that address themselves to the civilization of the nineteenth century, the question of dental surgery stands at the head of the list. Why? Because all other departments of learning and advancement have received more assistance and attention than the dental profession, and because it is not yet an universally recognized fact that the human family needs the good offices and attention of the dentist as they need their doctor, as they need their preachers, as they need their teachers and their lawyers.

It is becoming in America to open wide her gates and extend a welcome to the dental world, because she is a leader in that vocation. We are here for the purpose of furthering the grand work of our profession until the civilization of the present age shall be touched and benefited to that extent that it will tend to the increase of the average length of human life, and perhaps be a potent factor in the perpetuation of the most remarkable civilization in the world's history.

To you, gentlemen from foreign countries, it is my pleasure, as well as my duty, to extend a most cordial welcome; and in calling your attention to the ensign of the republic, the stars and stripes, I wish to say that banner bears not only the insignia of political and religious liberty,

Digitized by Google

but its most beautiful significance is the gracious hospitality we extend to you to-day; all of this, and more if we had it, would be freely offered to you on this notable occasion in the history of odontological investigation.

In conclusion, allow me to ask you to grasp my hand in your imagination, and feel the pulsations of the great heart of the American people, beating in unison at this very moment; and while I stand in this attitude, allow me to say, that it fills my soul as the united sentiment of this great nation passes from me to you, when extending this formal welcome.

THE PRESIDENT. We had expected to have had present with us to-day the gentleman whose name stands first on the list of vice-presidents, Dr. Thackston, of Virginia. He was one of the second class that graduated from a dental college, and was also a charter member of the American Society of Dental Surgeons in 1840, and is one of the veterans in dentistry to whom I shall refer in my address. For over half a century he has been eminent as a man, as a dentist and as a civil magistrate, and has won the affections of everyone who has had the pleasure of his acquaintance. I consider it a personal loss that he is prevented from being with us to take the chair, but his advanced age is a sufficient excuse. A letter showing his interest and regret for his inability to attend will be read by the Secretary-General:

FARMVILLE, VIRGINIA, August the 9th, 1893.

DR. A. O. HUNT, *Secretary of the General Executive Committee of the World's Columbian Dental Congress:*

DEAR SIR,—Will you do me the kindness to report to President Shepard my inability to visit Chicago, or take part in the transactions of the "Columbian Dental Congress," which convenes the 14th instant?

I am in no condition to make a trip, and unlooked for and unanticipated circumstances forbid my leaving home at this time. I beg to assure you, and through you as the Secretary of the General Executive Committee, assure the President and his subordinate officers that my failure to

Digitized by Google

meet and work with them is a disappointment that touches and saddens me more keenly than I can find words to express. I appreciated and valued the honor conferred upon me by the Executive, or Electoral Board, and while I have worked for the promotion and success of the grand enterprise, I wanted to do more, and to fulfill every trust assigned me, to be present, and see the Congress through. This the "Fates" are pleased to deny me, and leave no choice save submission.

With every good wish for the success of the Congress, which I feel is already assured and with highest and warmest regards for the President, and each and all of his staff and executive officers and members I have the honor to be your fellow craftsman and obedient servant,

W. W. H. THACKSTON.

THE PRESIDENT. The second name upon the list of vice-presidents is that of Dr. W. H. Morgan, of Tennessee. He expected to be present but a sudden illness makes it impossible for him to attend. We all regret the absence of this other distinguished founder of dentistry. He has sent a letter which will be read by the Secretary-General:

NASHVILLE, TENN., August 8, 1893.

DR. L. D. SHEPARD, *President World's Columbian Dental Congress, Chicago, Ill.*

MY DEAR DOCTOR,—Illness will prevent my being present at the World's Dental Congress. This I regret as I had hoped at least to be present and to enjoy the benefits of the meeting and give you my moral support, and if possible assist you in the discharge of the arduous duties devolving upon you as its chief presiding officer.

I have been in hearty accord with the various plans of your most excellent executive committee, and had hoped to be able to do my humble part in contributing to the success of this most important event in the history of dentistry.

From my knowledge of you and your allies, I am in advance assured of the successful realization of the objects

Digitized by Google

of your labors, and shall be with you in spirit, though not permitted to take part in person.

Fraternally yours,

W. H. MORGAN.

THE PRESIDENT. I will now call upon the gentleman whose name stands next upon the list of vice-presidents, Dr. A. L. Northrop, of New York, to take the chair.

DR. NORTHROP. It now gives me great pleasure to introduce to you the president of this Congress, Dr. L. D. Shepard, of Boston, who will deliver the Inaugural Address.

INAUGURAL ADDRESS BY L. D. SHEPARD, A.M., D.D.S., D.M.D.

It is becoming that the gathering of the nations in this wonderfully energetic metropolis, in this memorable year for America, should be taken advantage of for the holding of an Exposition of Dentistry, of all countries, in all branches, scientific and practical, as it exists to-day.

The origin of the Congress dates from action taken three years ago by the two governing dental societies of the country—action which anticipated, I believe, the organization of the World's Congress Auxiliary, with its high aims and broad plans. We were happy to ally ourselves with the Auxiliary, and so participate in the successful administration of its high educational result. While our autonomy has been preserved, we are proud to be one of the many Congresses held under its auspices for the good of society.

The two societies jointly created a trust, by the appointment of a General Executive Committee, and agreed "that any action that this committee may take shall be final and binding."

The only instruction to the committee in what might be called its charter was "to take such action as in its judgment it may deem best for creating an organization for the purpose of holding a dental meeting in Chicago in 1893, which the reputable dentists throughout the world shall be invited to attend."

Digitized by Google

It was understood that this organization should be *sui generis*, complete in itself without continued corporate existence. The committee accepted the trust as a great and responsible one, and has worked assiduously to justify the confidence reposed in it. It has ever endeavored to do the best thing and to be just to all.

The committee understood that the primal and fundamental object was to hold a dental meeting so broad and catholic in spirit and policy that it should be essentially inclusive of everything good and exclusive of none, to the end that all creeds may be heard and the truth through a multitude of counsel be evolved.

In accordance with this conception the invitation to membership was so broad as to include every dentist in the world who was considered respectable and honorable. The only conditions were that he be a legal practitioner in his country and carry on his practice in accordance with recognized ethical principles. The dentist of affluence whose clientèle is most aristocratic has no more right here than the humblest of those who honor our vocation by good work in the remotest country village.

Perhaps of no other profession of equal altitude and amplitude can it be said as of dentistry, that its evolution is embraced within the span of one human life.

There are men living to-day, still active and officers of this Congress, who were in practice in the day of small things of our profession. They are with us, witnesses of the marvelous march of progress; veteran survivors of the noble army of investigators, inventors, authors, teachers and honorable workers who, in various spheres, with diversified talents, with patient toil, with fidelity to present duties, and with hope and faith were achieving the victory which we celebrate to-day.

Other professions and other branches of the great healing art have made great strides in the same space of time, but of no other vocation or profession devoted to human happiness and amelioration, except perhaps photography and applied electricity, can it be said with equal truth, that

Digitized by Google

for system and well rounded development, such a contrast can be shown between the humble acquirements and achievements of the youth of the men referred to and the ripened conditions existing to-day. Medicine, unlike mathematics, is not an exact science, but of all branches of surgery there is probably none in which the realization of the ideal is so nearly secured as in dentistry.

All vocations are entitled to honor where the work is honest and the ends sought for are commendable, but especial honor has ever been rendered to those vocations which deal with human ailments and sufferings, whether mental or physical, and to such vocations from antiquity the differential honor of the name profession, formerly more narrowly used than at present, has been given. The relative rank among professions is not unimportant, but can we not claim with proper modesty and truthfulness that for the prevention and amelioration of human suffering, and for the peace, health and prolongation of human existence, dentistry is to-day without a peer among them all?

It has been allotted to others to present to you the latest phases of every department of professional study, scientific, practical and humanitarian, and to demonstrate the knowledge and skill in theory and practice. The ablest men in dentistry in the world will bring the products of their brains and hands before you. The week will be full to overflowing with interesting and valuable papers and discussions, with brilliant lantern illustrations of the patient and self-sacrificing investigations of men truly scientific, who have delved into the mysteries of cell life, and will bring before our eyes the great unseen, wherein lies the foundation of all etiology and scientific knowledge and progress. Others, with skillful hands working in harmony with active brains, will demonstrate the manifold practical applications of theory and experience for our better equipment for the daily duties of the office.

In presenting to you this inaugural address, my duty it seems to me should be, not to anticipate or encroach upon the work of these others, but to attempt to give a brief

Digitized by Google

outline of the evolution of the profession with the salient points which mark its progress.

That dentistry to some extent is an ancient art cannot be questioned, but so meagre are the references to it, in what remains that is authentic, that we may dismiss it from consideration at this time with the remark that nothing of value has come down to us from antiquity. The same is true of all the past up to the century preceding this. In fact, even as an art we may consider dentistry as modern, while as a science it is altogether modern.

Time will not permit me to review at length what is known of its condition in the last century, nor shall I refer but briefly to the conditions in the early part of the present century. The valuable report which will be made by the Committee on History, with so many co-laborers, will, I have no doubt, give us a full history, for the first time, of early dentistry in this country. This Congress would be well worth its cost if no other result should come of it but this.

There are no sharp lines of demarkation in evolutionary processes, and in their review we find the changes to be so gradual and long continued that it is difficult to fix upon a time which is so distinctively marked as to be called a natal day. We have been accustomed to date the birth of a man from his advent upon the visible stage, and yet that day witnesseth but a change of environment, and as a large proportion of humanity believe, the birth of the soul dating months before. So dentistry had its embryonal stage; its inception is shadowed by the mists of antiquity. Through ages it slowly gained, and we cannot describe its progress. During the last century and in the early part of this century, there were signs of life and movement; the quickening had taken place, the world was expectant, and the joyful consummation by the birth of a new profession, freighted with beneficence to suffering humanity, occurred in 1839 in the city of Baltimore by the organization of the first dental college in the world. As a scientific profession that is its natal day. There had been life before as in the case of the man,

Digitized by Google

but the environment had so changed that now there was a new air to breathe, new sources of nutrition, the barrier of the previous restricted environment was removed and there was free chance for growth to the stature of the full typal ideal.

Let us not forget to hold in the highest honor the devoted men who assisted at this birth. They are not the fathers of scientific dentistry, the primal causes date further back, but their care, their oversight and efficient ministrations, in guiding and assisting in the culmination of evolutionary changes at its critical period, was most creditable. Like the Great Physician they thought less of self than of humanity. They brought into the world the good "Evangel" of dentistry, for previous to that time knowledge and skill were guarded and sold as private property, while that day heralds the advent of "good tidings" to every man in search of knowledge for the good of men. The dental aspirant before that time found every avenue to knowledge carefully defended. Knowledge could only be obtained in the private office of a dentist, and the ambitious student was obliged to buy it, frequently at fabulous prices, prohibitive to the majority, The dentist who had obtained reputation thus received considerable revenue from such seekers—and in time exacted a promise of the student to likewise guard the information imparted.

The Baltimore College of Dental Surgery was the first Thesaurus of dentistry. Here were first deposited the stores of knowledge which before were in individual keeping. Here, too, also for the first time in dentistry, for a stated moderate price, the student could draw from this treasure-house all the accumulated knowledge it possessed.

Let us bear in mind that the prominence given to the establishment of this first professional school, as marking a natal period, is not primarily because it was the first professional school; that is of course noteworthy, so is the establishment of a new manufacturing business in a community, for it may be followed by other enterprises, and so the place becomes prosperous—but the point should be emphasized,

Digitized by Google

and it is the great point, that here was the beginning of a change of *spirit* as well as of method. Before this it was a trade, ever mindful of self, accumulative, afraid of competition, exclusive, faithful to the immediate patient and anxious to do him good, but regardless of the rest of the world, dominated by selfish interests, carefully hoarding knowledge, with no broad, professional spirit—no brotherhood feeling.

It is hard to realize at this day, when there is such freedom—such fraternal feeling, and actual competition to impart knowledge, that such a contrast in professional spirit could have existed six decades ago. It *is* a fact, however, and there are members of this Congress who commenced their study of dentistry in the old way. In my opinion this change of spirit is at the foundation of the new era, and all progress since then may be said to rest upon it.

With similar prophetic vision and patriotic motives in this same epochal year, the great hand-maid and co-laborer of the college was established by the publication of the first dental periodical in the world, the *American Journal of Dental Science.* The same spirit, the same ambition for the profession, and the same regard for humanity actuated the generous and enthusiastic founders of journalism as of the college.

As human nature is constituted the college and the magazine are not enough to redeem and to enlighten. A few are reached by these agencies, but to stir the great mass, such is the inertia of ignorance and routine, the magnetism of personal intercourse is needed. That the succeeding year, 1840, should witness the supplying of this requisite, is another proof of the vivifying forces operating at this period.

The same few pioneers of progress who started the college and magazine in 1839, in association with others of like spirit and motive, on August 18th, 1840, met in New York and organized the American Society of Dental Surgeons.

No authentic records of any previous dental society exist. So this society may be respected as the prototype of the multitude of societies which since then can justly claim so great a share in the growth in which we rejoice to-day.

Digitized by Google

In the organization of this society, the resolution offered by Prof. Chapin A. Harris, for the appointment of a committee to draft a constitution and by-laws, commenced with these words which have proved prophetic:

"*Resolved*, That it is the opinion of this convention that the science of dental surgery would be advanced and the interests of all well informed practitioners and the community at large, be promoted by the formation of a national society of dentists."

And in the constitution which was adopted, the first article struck the key-note for all time in these words: "The objects of this society are to promote union and harmony among all respectable and well informed dental surgeons; to advance the science by free communication and interchange of sentiments, either written or verbal, between members of the society, both in this and other countries; in fine to give character and respectability to the profession," etc.

We thus see, within a few months, the erection of the great tripod upon which all professional advancement must rest—the college, the journal and the association.

The first aimed to thoroughly prepare the novitiate for the highest usefulness, while the broad field of the others was the great mass of practitioners of varied proficiency.

Dr. C. W. Ballard, of New York, in an essay describing the profession at this period, says it might be divided into three classes:

The first class, embracing about one-half of all in practice, "consisted of those whose ignorance was their only excuse for the injuries they inflicted upon their patients, and ultimately their profession, as also of those who, having purchased or traded for a secret or two, depended upon bold-faced and unblushing impudence for their success. . . . Such men could only stand high in their own estimation, by dragging the profession down to their level. . . . Dentists, to this day, suffer to some extent from the odium brought upon their calling by the acts of these men. Dentists of this class knew little, and cared less,

Digitized by Google

about the duties devolving upon them, and yet they were always ready to receive pupils and instruct them in the secrets and mysteries of dental science, provided they were well paid for it. The fees exacted in these cases varied from five dollars to one thousand. . . . The length of time occupied by these initiatory proceedings depended very much upon the ability of the student and the ignorance of the teacher. It was generally conceded by these dentists, that the shorter the time wasted in this manner the better for all parties."

The second class, embracing about three-eighths of the whole number, "may be considered as consisting of those dentists who, having obtained as great a knowledge of the principles and practice of dental surgery as their time, means, or opportunities would allow, came at once to the conclusion that so long as they did the best they knew how for their patients, and comported themselves in other respects as became good citizens, they had done their whole duty. . . . With these may be included those who commenced practice with little or no education, and were compelled, in order to compete with those around them, to add, by every means in their power, to the knowledge and experience that their practice was daily giving them. Many of these men eventually became, to a certain extent, good practitioners; but, of the best of them, it would be difficult to say whether the good or the evil which they had done in their day preponderated. Dentists of the second class were much better acquainted with their professional duties than those first described; and very many of them excelled in that branch of the practice known as mechanical dentistry; and, in justice to them, it must be borne in mind that, at the time of which we are writing, mechanical dentistry was considered, by a majority of the profession, to be by far the most important part of dental practice."

Those of the third class, about one-eighth of all, a good proportion of whom were medically educated, "had, as a result of their course of practice and deportment generally, acquired far more reputation and influence. . . . These

Digitized by Google

few men seemed, from the outset, to have been impressed with the belief that the resources of the science were by no means developed—that dental surgery held a position far beneath that to which it was entitled . . . and that, as all these evils could and should be remedied, it was their duty to devote a portion of their time and energies to the work."

It will be found that this latter class, numerically so small, was the leaven which was to redeem the whole mass. The same law held here as in material things, that the quality of the leaven was more important than the quantity.

In the year 1841 was enacted the first state law in regard to dentistry. It is probably, also, the first law in any country. I have not included legislation as among the important and fundamental causes of dental progress, for the reason that the Alabama law stood alone among the states in this country for over twenty-five years, the next law to be passed being that of New York, in 1868. The English law was enacted in 1878, and in other countries about that date or later. While an indirect and inevitable result of dental laws has been to help the colleges by making an education a prerequisite to legal admission to practice, and hence to elevate the standards of the profession, there could be no justification for such prohibitive or restrictive enactments except as a safeguard to public health under the general police powers which in modern times have become so broadly applied and universally supported by the judiciary.

The struggle to secure these laws has been long and hard. Many efforts have proved repeatedly unsuccessful, but opposition has been overcome, until at the present date nearly every state and country has such laws, identical in object and essential features, and varying only in what might be called minor details. There are few now who doubt their justice and usefulness.

In securing their enactment the profession has generally taken a leading part, and it can be truthfully claimed that the motive has not been selfish but philanthropic.

The next event in dental history was so brilliant as to be

Digitized by Google

worthy of being called the most notable and beneficent discovery of the century or of all centuries—anæsthesia. What discovery or invention is comparable to this by which "the knife of the surgeon is steeped in the waters of forgetfulness and the deepest furrow in the knotted brow of agony is forever smoothed away," to quote the poetic words of the venerable, but still youthful author of the term anæsthesia, Oliver Wendell Holmes? While there has been an ether controversy, there cannot be an anæsthesia controversy. The ether controversy was waged with great earnestness and bitterness, but with the lapse of time and the removal of those directly interested, the credit is now generally given to the late Doctor Morton, a dentist of Boston. He it was who took his life in his hands, and with sublime courage or audacity, put in jeopardy human life to solve the problem of anæsthesia with ether. He traveled in darkness an unknown road. He succeeded and demonstrated to a skeptical world anæsthesia by etherization. The Massachusetts General Hospital justly and elegantly expressed the sentiments of mankind in its inscription upon the present given him in the words: "He has become poor in a cause which has made the world his debtor."

Without detracting from the great honor due to Dr. Morton, greater honor is due to another dentist. For it is true, and is now being admitted, that Dr. Morton but traveled in another path, though further than had been traveled two years before to his own knowledge, by the true and original discoverer of anæsthesia, from whom he derived his incentive, the late able, but less persevering and obstacle overcoming dentist of Hartford, Dr. Horace Wells.

If we grant that the whole includes all parts, though one part may be so brilliant as to overshadow the rest; if we grant that an inventor of something entirely new is entitled to credit superior to him who invents an improvement or modification, even though the latter may be better; if we grant that the discoverer of a great truth or principle in nature is greater than the one who, following in the same lines, by using other agents or methods, more fully or suc-

Digitized by Google

cessfully demonstrates the truth or principle, we must admit that the greater honor is due to Dr. Wells—provided it is true that, in 1844, two years previous to Dr. Morton's discovery, Dr. Wells did intelligently and publicly, with full appreciation of the phenomena, perform painless operations in dentistry and surgery, by the administration of nitrous oxide gas, given for that specific purpose. I think that history bearing this out is too explicit, too minute and too reliable to render this statement debatable. Let us inquire what are the admitted facts. It is accepted by every one as proven:

1st. That Mr. G. Q. Colton did give an entertainment in Hartford, in 1844, by the exhibition of laughing gas, for amusement.

2d. That Dr. Horace Wells was present in the audience.

3d. That Mr. Samuel A. Cooley, in his antics while under the influence of gas, injured his leg quite severely.

4th. That, on his recovery from the effects of the gas, Mr. Cooley was surprised at the injury, and said he had felt no pain.

5th. That Dr. Wells concluded from this that the gas would be useful in extracting teeth, and so expressed himself.

6th. That Dr. Wells did put his inference to proof by an actual experiment upon himself, Mr. Colton giving the gas and Dr. J. M. Riggs extracting a tooth.

7th. That his object, stated beforehand, was to ascertain by trial whether such exhibition of the gas would render tooth extraction painless.

8th. That Dr. Wells did state at once that the operation was painless.

9th. That Dr. Wells did many times give the gas for painless operations in Hartford, both in dentistry and surgery.

10th. That Dr. Wells had such faith in his discovery that he came to Boston in the winter of 1844–45, and was introduced to the hospital surgeons by his former pupil, Dr. Morton, and did administer the gas at the Massachusetts

Digitized by Google

General Hospital, for an operation, with the express pre-stated purpose of demonstrating that operations could be painlessly performed.

11th. That the exhibition at the hospital was only a partial success.

12th. That the students derided him, and that he went home to Hartford disappointed and disheartened.

13th. That Dr. Morton had knowledge of some of these facts—anterior to 1846.

14th. That the use of the gas as an anæsthetic was discontinued in Hartford and elsewhere after Dr. Wells' death, and the successful demonstration of the efficacy of ether for the same purpose.

15th. That in 1862 the use of the gas for anæsthetic purposes was resumed, and that it has since been proven throughout the whole world to be a safe and reliable agent for that purpose by many millions of exhibitions.

The discovery of the efficacy of chloroform in 1847 and its rapid spread over Europe to the almost total exclusion of ether gave such fame to its discoverer, Dr. Simpson, afterward Sir James Y. Simpson, that for many years in Europe he was generally reputed to be the discoverer of anæsthesia.

These two anæsthetic agents had the field almost exclusively for about fifteen years until the revival of nitrous oxide in 1862, so that most naturally the agent used and the resulting anæsthesia became synonymous terms in the general understanding. It is not strange that the neglected and forgotten nitrous oxide during this long period should have had as companion in its oblivion the name and fame of Horace Wells. But its revival in 1862, and its general and successful adoption throughout the world demonstrates that it is second to no other agent, and proves that its short use, before ether eclipsed it, was due to fortuitous circumstances in no way detracting from the merit rightfully belonging to the diffident, sensitive, generous and noble man, who so soon after, disappointed and with unsettled intellect, met his tragic death, but whose memory is still green in the field of his labors and in the hearts of his fellow-citizens.

Digitized by Google

With commendable regard for truth and history his city and state have testified to his worth and achievement by erecting his statue in enduring bronze.

A very beautiful monument, commonly designated as the Ether Monument, was erected in the Public Garden, Boston, in 1867, by the munificence of a private citizen.

The inscriptions read:

"In gratitude
For the relief
Of human suffering
By the inhaling of Ether
A citizen of Boston
Has erected this monument
A. D. 1867."

"To commemorate
The discovery
That the inhaling of Ether
causes insensibility to pain
First proved to the world
at the
Mass. General Hospital
in Boston
October, A. D. 1846."

At the time of the erection of this memorial many of those active in the first exhibition of ether were still living, and were friends of the donor. It is presumable that great care was exercised to make the inscriptions impregnable to criticism. Two things should be especially noted—the absence of any name and the restriction of credit to ether alone.

However we may view the question as to the right of first place of honor for Wells or Morton, we can congratulate the profession that both were dentists and that this greatest boon of the ages came from our ranks. So great an authority as Lecky says in his "History of European Morals": "It is probable that the American inventor of the first anæsthetic has done more for the real happiness of mankind than all the philosophers from Socrates to Mill."

Digitized by Google

While in the following decade, 1850 to 1860, colleges, magazines and associations multiplied and jointly contributed to bring the profession more and more in touch with progressive thoughts and truths, the most distinctive discovery of the decade and most momentous in its influences was that property of gold, which, previously considered detrimental, was now to be welcomed as its most valuable characteristic—cohesion. The introduction of crystal gold and the discovery of the cohesiveness of freshly annealed foil laid the foundation for the new era in operative dentistry. Let us never forget that while others claimed the latter discovery and doubtless had known of it and availed themselves of it for some time, Dr. Robert Arthur lost no time in freely sharing his discovery, as soon as made, with the whole profession. He thus achieved a distinction of which others have never been able to deprive him.

The descriptions and illustrations of operations with crystal gold in the essay of that venerable and respected Nestor still with us, Dr. W. H. Dwinelle, published in 1855, might still answer for an essay of to-day. Here was the renaissance of operative dentistry. Here was the dawn of the new era of restoration; the parting line between antique mutilation and disfiguration and the subsequent devotion to beauty and typal form. It was the first great advance in practice. It was but natural that it should soon be supplemented by improved instruments, the mallet, the rubber dam and the engine. How great a revolution has resulted from these instruments and appliances none can fully realize, except those of us who have been long enough in practice to remember the struggles necessary in the old era. However radical or conservative are the views we hold to-day, there can be no question of the tremendous shaking up of the profession in its thoughts and practice which resulted from these innovations.

While most of the appliances just mentioned came in during the decade 1860 to 1870, they do not constitute, it seems to me, the distinctive advance of that decade. There had been a disease of the mouth, which up to this time had

Digitized by Google

been either unrecognized or regarded universally as incurable. It had from a remote period been described in the books as scurvy of the gums, or some such term, and had been treated only by washes or medication. It was considered inevitable and irremediable that sound teeth should be lost, self-extracted. A prophet arose who taught that such deplorable conditions were always preventable if taken in time, and frequently remediable by surgical treatment, when the disease had made quite extensive inroads. He was received as prophets usually are, except by a few who early became his disciples. He was not a profound physiologist or pathologist, and did not present a theory or description which met the approval of experts—but he had lived many years—was a man of observation and reflection, and while not scholastic or correct on every point, his observations had been clear and his deductions in the main correct, so that the treatment, which he was the first to bring out and demonstrate, is even at this day, after so many of our best pathologists have devoted much time to the study of the disease, accepted as the foundation of all treatment.

The men who knew him, saw him operate, were taught by him and were successful in following his methods, were wont to call the disease after his name. This was not correct we know, for he originated only a treatment and did not describe a disease, but the fact remains, and there are enough living to testify to it, that as a result of his life and efforts, of the seed which he planted, a dire disease has been robbed of its terrors, the profession has been stimulated throughout the world to study its etiology and progress, and the premature loss of teeth from this disease is no longer considered providential or respectable.

While operative dentistry has continued to ride constantly upon a flood-tide of progress and improvement, prosthetic dentistry has had its ebbs and floods. Sixty years ago the great mass of the profession were unskilled as operators, but fairly skilled as plate workers. They could not save teeth, but they could replace their loss. In plate work the culmination of prosthetic skill and artistic production

Digitized by Google

came with the invention and perfection of porcelain or continuous gum. After the introduction of vulcanite, the general disuse of metals made laboratory skill of little value, and hence it was neglected or ignored in the preparatory training of the student. The manufacturers supplied a great variety of instruments, so that the forging, shaping and tempering of instruments became almost a lost art. The ease and facility of working of vulcanite, not only called for little ingenuity and skill, but so obliterated the distinctions, that the novice, after a few weeks of instruction and practice, could compete with the most experienced, and this important and most beneficial branch became the refuge and ally of incompetence and quackery. The evils resulting from the wholesale extraction of good teeth were most deplorable and cannot be estimated.

There has been grave doubt whether vulcanite in dentistry has been a blessing or a curse to the world. A superficial observer might contend that when organs so important to health were lost, it were a blessing that substitutes could be within the reach of all but those in abject poverty. But we know to what a shameful extent the Harpies in our number, by appeals to cowardice and cupidity, despoiled the mouths of the confiding public of millions upon millions of strong and healthful teeth to make place for their bungling, disfiguring and filthy substitutes. It did seem for a time that the whole profession would be engulfed in a sea of obloquy. But the reaction happily came, the tide turned, and we can congratulate ourselves and the world that the danger is fast disappearing.

The increase in the number and the constant elevation of the standards of the colleges year by year raised the ratio of the educated, the periodical literature was more generally taken and read, societies multiplied and did most valiant missionary work, codes of ethics were adopted and enforced, laws were passed for the protection of society, which, while licensing all in practice to continue practicing, irrespective of their knowledge or skill, raised a barrier against the admission to practice of the ignorant and incom-

Digitized by Google

petent. From all of these and other causes, the tone of the profession was gradually raised, and juster and broader views of what was right and best for the patient became more and more prevalent.

But the cause more important than any or perhaps all of the foregoing for the increase of laboratory skill, and the retention of teeth and roots, is to be found in the invention of the modern artificial crown and its corollary, the bridge.

This is the distinctive improvement of the past twenty years. Within that period more than one hundred different crowns and bridges have been invented and published.

The result has been two-fold. It has made laboratory skill of more importance and value to the dentist than ever before; and it has arrested the great "slaughter of the innocents" by making the retention of the roots of teeth in the mouth obligatory.

At various periods the separation of the two branches of practice has been urged by prominent men of each branch—but by these inventions the two branches have been bound together in bonds which seem indissoluble.

The chief drawback to perfection in the past has been the inability of our art, however skillful, to permanently save some teeth. The inherent defects of structure or of surroundings made the best operations but temporary, and these teeth had ultimately to be lost and substitutes applied. Now, after all the worst has happened, the root is still of inestimable value for crowning. This invention seems to place a climax upon our art.

In recent years there has been an increasing interest in the deeper causes of physiological function and of pathological departure from normality. Histological investigations have been pursued with great enthusiasm and thoroughness, and the advances in other departments of microscopic research are largely due to methods which were first devised and employed in the study of dental tissues by ingenious dental microscopists. These fields of research are inviting to the student, but demand great courage and self-denial when cultivated by those whose labors are severe

Digitized by Google

and fatiguing in the daily routine of the office. We rejoice that there are so many dentists throughout the world who are devoting their energies, after the day's work is done, to these problems. We shall be encouraged as well as edified through the week by the display of results already achieved.

How crude and speculative seem the theories of dental caries which obtained less than a score of years ago when contrasted with the brilliant demonstrations of the renowned American professor of Berlin, founded upon patient and protracted investigation after the most approved modern scientific methods. Though from unavoidable circumstances detained at home, he has shown his interest and co-operation by forwarding a paper. There are many others whose fame is not bounded by their vocation or their country. They are known to the world as scientists and cosmopolitans. However skillful and judicious a dentist may be as an operator, this sphere of his usefulness is limited in space and not far reaching, while these men are working for mankind at large and for succeeding generations. In view of past victories may we not confidently expect that the etiology of other still obscure diseases, like erosion and pyorrhœa may be solved, so that we can either prevent or successfully treat them?

Let us not grudge explorers of the unknown their only recompense, the meed of praise and applause for what they have done and will do for the profession and for humanity.

I am conscious that in this review of the past I have failed to do justice to the subject.

Time is so limited, and the field is so rich and extensive that I have felt constrained to select for elaboration only those facts and movements which seemed to have had the greatest influence.

Joy and comfort have been brought to many repulsive or speechless sufferers by the improved appliances for the restoration of feature or of function resulting from malformation or disease. Orthodontia might be called a new art, from the great advance in knowledge of it and of the methods and appliances for correction, and recovery of usefulness and beauty.

Digitized by Google

But the most prominent of the practical topics which I have ignored is probably plastics, the increasing use of which has wrought a great change in practice, and been of incalculable benefit to humanity. From the time of the memorable controversy which caused the disruption of the first dental society to the present period, this subject has engrossed much time and talent in our societies and literature.

The so-called "New Departure" arrested the attention of every reader from its novelty and from its claim to be founded upon strict scientific experimentation. Laboratory investigations are valuable if conducted upon strictly scientific methods, but is not a theory based upon the observation of the phenomena as they are presented in the oral cavity also essentially scientific if the observer is competent and the series of observations have been correctly performed? In either case accuracy of observation, in connection with a clear appreciation of exactly what constitutes the scientific method and the intelligent application of that method in the elucidation of the point at issue, is what is needed. I do not, however, attempt to discuss this subject, but only to refer to it as one which has had a great influence in stimulating thought, making us closer observers, and modifying practice.

The theory of the bacterial origin of diseases and antiseptics have engrossed much study and enthusiasm. It seemed that we were on the eve of a solution of all etiology by the isolation of the specific pathogenic germ of every disease and that to prevent or cure all that was necessary was to ascertain and administer the proper germicide. Clinical records, however, have failed to sustain the ardent expectations of the more sanguine. The germicide has taken a place subordinate to a strict observance of absolute cleanliness, and we see acknowledged the importance of *vis vitæ* as a factor in securing immunity from the attacks of bacteria everywhere present.

Light, however, is being shed upon many mysterious bacterial phenomena by a more thorough acquaintance with

Digitized by Google

ptomaïnes, leucomaïnes and the extractives which are toxic and auto-intoxicants.

Fortunate practical results have come in the character of a great reform in the care of instruments and the sterilization of everything connected with operative work.

All through the years there has been an underlying hope that improvement of tissue and greater resistive power would result from advances in prophylaxis. Apart from the improved conditions resulting from changed manipulation, like contouring or greater care in cleanliness, little has been accomplished in purely dental prophylaxis. Special feeding for the teeth or treatment in the line of therapeutics has not rewarded patient trial.

The tendency of prophylaxis to-day is to develop along physiological lines by more special and minute observance of the laws of hygiene. Proper food, its preparation for assimilation, out-door exercise, in a word, rational methods of living, are no more important for the preservation of health than for the building up of tissues throughout the whole body, of such perfectness of structure and function as to be able successfully to resist deleterious attacks. Thus viewed, prophylaxis has made great strides, in which the teeth have shared as part of the general economy. These topics and many others merit more extended consideration as factors of progress.

While I have refrained from specific mention, with two exceptions, of the living exponents of progress, I cannot close without a brief reference to the many upon our Roll of Honor. It would be pleasant to name them, review their lives and pronounce their eulogy. "They builded better than they knew," and the profession and the world are their debtors. Our duties are less onerous, our paths are more pleasant, our position among men more honorable, and the health, comfort, and relief from suffering of mankind greatly enhanced as a result of the lives and labors of the noble men who, in the language quoted before, were "impressed with the belief that the resources of the science were by no means developed" and that it was their duty to devote a portion of their time and energy to the work.

Digitized by Google

Some of these apostles of progress are known to us only by their records, but the form, the features, the voice, the presence of some of them are fresh in the memory of many here present.

Can we doubt their approval to-day of our assemblage, or of their presence among us and their benediction? This Congress is but a continuation upon the same lines, or a culmination, of their patient, devoted, self-sacrificing work for God and man.

Under the authority of the trust committed to us by the dental profession of America, we are now assembled and organized as a World's Dental Congress, to advance the interests of dentistry throughout the world. Science and art, twin out-growths of mentality, should know no boundaries, nor should there be any schools of thought, treasure houses of knowledge, or gymnasia for training to usefulness, with barriers founded upon race, creed or nationality where the health of humanity is involved. As dentists we meet here to-day, brothers of one family, with common interests, mutual respect, and unity of aspiration and expectations. With infinite care and labor the banquet has been prepared, and we are invited to partake of the ripest fruits of professional culture which could be gathered from every quarter. Let us partake joyfully, not for the pleasure of the day alone, but from the consciousness that each feast brings with it the earnest of greater strength to-morrow.

In my official capacity I bid you all welcome—a welcome to every American dentist, who has come with comparative ease, but an especial welcome to those who have traveled long and far, from foreign climes and over broad seas, bringing with them the choice perfumes and rare products of a different soil from ours, but which are indispensable to the adornment and complete furnishing of the universal banquet of good things for us and for mankind. That these may find their visit both pleasant and profitable is the wish of every one of their American hosts. And finally, let us all improve the opportunities presented, that this week may be so full of inspirations and valuable results that it shall be a mile-stone in the march of dental professional progress.

Digitized by Google

THE PRESIDENT. The next order of business is the reception of foreign representatives. The introduction of an Englishman to an American audience is primarily the introduction of brothers. [Applause.] England and America have contributed largely to dental progress, and we are happy to welcome a representative of England in the person of Dr. George Cunningham.

DR. GEORGE CUNNINGHAM, Cambridge, England. *Mr. President, Ladies and Gentlemen:* Allow me to thank you for this cordial welcome, this Niagara of applause, with which you have greeted the name of Great Britain and Ireland. To me it is oppressive because I am not too proud of the representation of my country here to-day. I am not really present as an official representative, and I regret that those of us who were appointed as honorary officers found it necessary to bow our heads to the decision of our representative associations adverse to sending official delegates.

A corporate body is said to have no conscience; and in this instance, owing to most regrettable misunderstandings, and, I must confess it, a certain element of narrow-mindedness, we found ourselves bound to accept the decision of the societies to which we belong. The development of the individual is in advance of that of the corporate body, and so I assure you that I had numerous requests from many influential members of these societies to express their kindly feeling toward their American confrères, and their regret for the necessity of the official refusal of your kind invitation. "Say something, if you can, over there to show that there is no real antagonism to this Congress and its objects," was the remark of more than one of our executive officers. I would call your attention to the fact that even those who have felt obliged to refuse the honors you have proffered them, have done active work in connection with the committee as a token of their kindly feeling and desire to participate in the work of this Congress. I am sorry that our representation is neither so influential nor so numerous as it ought to be, but we will endeavor to put forward something

Digitized by Google

in the shape of papers, and will be even courageous enough to take part in the demonstrations, which I am told is a bold thing for an Englishman to do in this country.

I cannot conclude without congratulating you on the fact that for the first time you are conducting an international congress on true ethical principles, and therefore if to-day we miss faces we have seen, such as that of Mr. Mummery, on similar previous occasions, we are glad to note the absence of others, both British and American, who, being unable to attend similar national conventions at home, found a too facile entrance to international professional gatherings abroad.

I am perfectly certain that this Congress will be a great success; and as to the absent, I am convinced the greater loss is theirs more than ours.

I thank you heartily for the kind reception of these remarks.

THE PRESIDENT. Holland was a refuge many years ago for some who were driven out of the country from which we have just heard, and who then came to America. Holland is now a home of what is right and progressive in dentistry, and we are glad to welcome her representative.

DR. JOHN E. GREVERS, of Amsterdam. *Monsieur le Président, Mesdames, Messieurs:* Je ne puis trouver d'expressions pour vous dire combien je vous suis obligé de l'honneur que vous me faites en me nommant président honoraire pour les Pays-Bas.

Veuillez bien en accepter ma profonde reconnaissance et soyez assurer que je l'apprécie hautement.

Permettez moi de vous féliciter du succes prodigieux de ce congrès et en particulier ceux qui l'ont projèté et qui ont contribué si énergiquement à constituer cette grande réunion universelle.

En vérité, ce congrès prouve une fois de plus, que dans l'Art dentaire, Columbia still leads the world.

L'Association des Dentistes des Pays-Bas m'a chargé de

Digitized by Google

vous transmettre ses saluts et de vous témoigner l'intérêt quelle prend à ce congrès.

THE PRESIDENT. To German investigations in every department of thought the world is indebted for much of its progress. We are glad to welcome the representative of Germany, Dr. Erich Richter, of Berlin.

DR. ERICH RICHTER. I thank you for the honor conferred on me and for the words of welcome tendered me. I am not a representative of all Germany, but of the German Association of American graduates in Germany, and the Berlin Dental Association, which includes American and German degrees. Some of you will remember a time, not over twenty years ago, when dishonor and disgrace were brought on American dentistry by a number of swindling concerns in this country selling degrees all over Europe. A good many availed themselves of this and disgraced the name of American dentistry abroad. That time has gone by, but it has taken years to convince the authorities in Germany of the difference between an honestly obtained diploma and a spurious license to swindle people under the pretext of being American dentists. As editor of a dental journal I have been fighting for the honor of American dentists in Germany. Now Germany and German dentists have had an awakening from their slumbers by the astounding progress of American dentistry, and the chasm that has excluded American dentistry has been bridged. In behalf of the two societies I represent, I extend a hearty salutation of brotherly love and wishes for the success of the Congress, and the hope that it may promote brotherly feeling the world over. To protect American dentistry, allow no one to leave its schools who has not thoroughly and diligently pursued the course of study required. The practice in Germany has followed mostly in American footsteps. True, the etiology of caries was discovered in Germany, but the discovery was made by an American, Dr. William D. Miller. [Applause.]

Digitized by Google

THE PRESIDENT. We welcome the representative of Austria in one of its distinguished dentists, Dr. Otto Zsigmondy, of Vienna.

DR. ZSIGMONDY. Im Namen der Zahnärtze Österreichs erlaube ich mir Ihnen für die freundliche Einladung seitens des „World's Columbian Dental Congress" den herzlichsten Dank auszusprechen. Gestatten Sie mir meine Herren, Ihnen die Versicherung zu geben, dass unsere Collegen in meiner engeren Heimath ein ebenso warmes Interesse an den Verhandlungen dieser Zusammenkunft nehmen als irgend ein anderes Land, und dass es der Wunsch Aller ist, dass diesen Congress ein unbegrenzter Erfolg begleiten wird.

THE PRESIDENT. At the Exposition there is a colossal statue representing Washington and Lafayette joining hands. Although that illustration is so grand a one of past history that we can hardly dare to quote it here, yet may we find that as a type and symbol of the union of America and France in furthering the progress of the profession. It has been settled that dentistry had its birth in France, and was nurtured in England and reached its culmination in America. We greet as the representative of that great nation, M. Barrié, of Paris.

M. BARRIÉ. *Mesdames, Messieurs:* Au nom de l'École Dentaire de Paris, au nom de l'Association générale des Dentistes de France, que seul, j'ai l'honneur de représenter, Mr. Levett, egalement délégué, n'ayant que venir au dernier moment. Au nom de ces deux institutions, lesquelles, par l'organe de Mr. Dubois, son représentant officiel au Congrès de Washington, vous ont invité à venir prendre part pour la première fois, à l'occasion de notre Exposition Universelle de 1889, à l'un de ces Congrès dentaire internationaux autonomes.

Au nom de la France, je viens saluer la grande Nation Américaine; qui a le droit a juste titre d'être si fiere et dont la devise est: "Progrès et Liberté."

Je viens vous apporter, mes chers confrères, nos sincéres

Digitized by Google

souhaits pour la reussite complet de ce Congrès, persuades d'avance de son succès, étant donnes la célébrité au point de vue professionnel dont jouissent de ce côté de l'Atlantique les hommes qui sont à la tête du "World's Columbian Dental Congress."

THE PRESIDENT. With the old Spanish colors, which the executive committee have adopted as part of the badges, and with the prominence of Spain in everything connected with the Exposition held in this city, it is proper and becoming that we should welcome its representative dentist among us, Dr. R. H. Portuondo, of Madrid.

DR. PORTUONDO. *Señor Presidente, Señoras, Señoritas, Caballeros:* Me considero orgulloso de tener en este acto el honor de representar ante Ustedes á mi pais España.

Las palabras no pueden expresar la gratitúd que tanto mis compatriotas como yo, sentimos por la hospitalidad que los Dentistas Americanos nos han brindado.

Soy Español, pero en mi profesion, Americano, por haber hecho mis estudios en este pais; tengo pues gran placer en encontrarme entre mis compañeros, y muy en especial en renovar antigua amistad con los que fueron mis condicipulos.

Siento infinito no poder expresarme en Inglés para reiterar á Uds. mis agradecimientos por las atenciones que se nos han dispesado.

Señores, deseo al Congreso el mejor exito en sus importantes labores.

THE PRESIDENT. I have the honor to introduce one of the vice-presidents from Italy, who represents his country in this Congress, Dr. Antonio Damiano Mela, of Genoa.

DR. MELA. Autorisé par le Conseil Directif de la "Società Odontologica Italiana," je délégue MM. Benasso Luigi et Mela Damiano dentistes à Gênoa, M. Solari Antonio dentiste à Bologne, Mr. Bowman dentiste à Turin, à représenter légalement la Società Odontologica Italiana au Congrès Dentaire Internationale de Chicago, chargés d'ex-

Digitized by Google

primer aux culteurs de l'art dentaire de toutes les Nations —reunis dans cette éminente ville du nouveau monde—les voeux de leurs confrères d'Italie, qui, ne pouvant prendre part à cette grande assemblée, souhaitent que tout ce qui se traitera au sujet de l'art dentaire puisse tourner au profit de notre art spéciale.

La Società Odontologica Italiana enjouée de ce grand évênement attend de la dite Commission un compte-rendu des travaux et des communications qui seront faites au Congrès.

THE PRESIDENT. We welcome as the representative of Greece, Dr. D. Caracatsanis, of Athens.

DR. CARACATSANIS. *Mr. President, Ladies and Gentlemen:* I salute you. Allow me, gentlemen of the Executive Committee, to thank you for the honor you have conferred upon me in making me honorary president and representative from Greece. I congratulate Americans, and hope my own countrymen, who are friends of progress, may always in future take part in such meetings and may bring to their own country that knowledge which America must be proud of having acquired. The object of our assembling here is for the promotion of a science which can best improve the condition of mankind and promote the progress of health. We heard of an American Congress when in Paris. May the results tend to make life more endurable, and enable us to practice beneficially in our respective countries.

The following cablegrams were read by Secretary-General Harlan:

MOSCOW, RUSSIA, August 14, 1893.

World's Columbian Dental Congress:

We welcome heartily the opening of the Congress.

PAUL ADELHEIM.

GRAZ, AUSTRIA, August 14, 1893.

World's Columbian Dental Congress:

Salutations.

BLEICHSTEINER.

Digitized by Google

HAMBURG, GERMANY, August 12, 1893.

World's Columbian Dental Congress:

I repeat thanks. Regret family sickness prevents my coming. Best wishes for success.

P. CALAIS.

ST. PETERSBURG, RUSSIA, August 14, 1893.

World's Columbian Dental Congress:

Thanks for my appointment as honorary vice-president. Welcome the inauguration of the Congress. Regret I cannot assist.

J. J. CHRUSTCHOW.

A telegram was received from MM. Godon and Ronnet announcing that on account of unavoidable delay caused by the steamer they would be unable to be present until August 15th.

Dr. J. S. BURNETT, of Uruguay, after being introduced by the President, said: *Mr. President, Ladies and Gentlemen:* I am, I think, the only representative of about the smallest and dearest little republic in the world, and, in proportion to its size, feel that I am the least competent of all the foreign members present to address such a learned and distinguished body of professional men.

For many years I have followed the movements of most all your dental societies, and have always envied you the opportunities you have had of comparing your work and ideas so as to be able to make steady progress. I have felt it a professional duty due to my clientele to accept your invitation and come to your great Dental Congress, and take advantage of your extensive and world renowned experience for the benefit of my country. I am very glad to be here and hope to be able to congratulate personally the gentlemen that first thought of getting up this colossal dental meeting. And above all I wish to congratulate the executive committee and officers of the Congress for the able way in which they have overcome all the difficulties natural to so large an undertaking. I sincerely hope you will now be

Digitized by Google

amply recompensed for your labors in finding your work will do good and be appreciated all over the world.

I thank you for your distinguished favor and wish the International Dental Congress all possible success.

THE PRESIDENT. We take pleasure in greeting Dr. Eben M. Flagg, Vice-Consul of the United States at Asuncion, Paraguay.

DR. FLAGG. I also have the honor to come from one of the smallest countries in the world. The welcome that you have given me I most heartily thank you for. I am in no way prepared to make a speech, but think the reception you have given me well repays a journey of about eleven thousand miles.

THE PRESIDENT. You hardly realize what an immense country is represented by our friend, Dr. Alfred Burne, who represents Australia and New Zealand. They have made great strides, have passed laws, and have taken their places with the other countries and continents which have been more extensively known in the past. We welcome Dr. Burne as the representative of the great continent below the equator.

DR. BURNE. *Mr. President, Ladies and Gentlemen:* I shall confine my remarks to saying that it is a great pity that the wave of depression, which is now passing over the colonies, has caused so many to be unable to present themselves here. New South Wales desired that I should be present to show our appreciation of American dentistry, as always shown by the fact that we send our students to America to receive their dental education. In behalf of the Dental Association of New South Wales I wish this Congress every success.

THE PRESIDENT. Switzerland is well known to Americans as a place of temporary sojourn. Some have received its hospitalities, and we are glad to welcome the

Digitized by Google

representative of this far advanced republic in dental affairs, Dr. Louis Roussy, of Geneva.

DR. ROUSSY. I am glad to say that there are in my country a great many dentists, who by their knowledge of dentistry and their eloquence and abilities would have been better qualified to fill my place as delegate, but they could not come. But as I am here I am glad to thank the President heartily for his kind speech of welcome. I would like to express the feelings of my fellow-countrymen for their American friends. In my country the dentists are improving in their art by means brought about by American dentists.

THE PRESIDENT. It is needless to say one word in regard to the past life and magnificent achievements of those who have been perhaps most highly honored in the world, the American dentists living abroad. A letter from Dr. Thos. W. Evans will now be read.

15 Rue de la Paix, PARIS, July 31, 1893.

DR. L. D. SHEPARD,

President of the World's Columbian Dental Congress,

330 Dartmouth Street, Boston, Mass.

DEAR SIR: It is with great regret that I find it impossible for me to be present in Chicago, on the 14th of August next, with that "American contingent in foreign countries," of which it has pleased the Executive Committee of the World's Columbian Dental Congress to make me the honorary President.

Considerations, partly of a private and partly of a semi-public nature, have caused me to feel it to be my duty to remain here. One of these, it may not be improper for me to say, is my desire to finish a work upon which I have been engaged for some time—that of establishing on a permanent foundation a home—"The Lafayette Home"—for American young ladies, who come to Paris for the purpose of studying art. Were I to visit the United States now, I fear we should be unable to open our home in October, and many inter-

Digitized by Google

ested young countrywomen of ours would be greatly disappointed. And as the matter stands, so am I. But I am older than most American girls, and, I doubt not, have met with more disappointments—or, at least, am better able to bear them. Nevertheless, I have been most reluctant to abandon the idea of visiting Chicago this year. I wished to see with my own eyes the evidences of the material progress of the United States during the past twenty years; to compare the Exhibition of 1876, which I saw, with that of 1893; to be able, on the spot, to fully realize how the Chicago that I knew over forty years ago has been transformed into the imperial city of to-day; and particularly I wished to meet the members of the Dental Congress, many of whose names are so honorably associated with works that have secured for our profession the high place it now holds among the recognized specialties of medicine and surgery.

It is difficult for one who cannot look back over the past thirty years, to understand what has been accomplished during this period in the interest of our profession—not simply in those matters relating to it immediately as an art, but also in directions that have gained for it public respect and distinction. And no where, I may add, have the merits and services of dentists met with more liberal and generous appreciation, than in Europe, where, it might have been supposed, that the conditions were unfavorable to a speedy recognition.

That these splendid results have been obtained is to be attributed in a very large measure to the intelligence and energy with which our own countrymen have devoted themselves to the study and practice of our art, and especially to the establishment of schools, whose reputation in foreign countries is now almost as great as was that of the famous medical schools of Italy 400 years ago. Modern dentistry is an American product, and there is therefore a special fitness in convening the first great International Dental Congress in Chicago in the anniversary year of the discovery of our country.

While deeply regretting that I cannot be present on this

Digitized by Google

interesting occasion, I am with you in heart, and especially so, as I feel sure that this Congress will have the effect of promoting, both at home and abroad, a still larger interest in scientific and practical dentistry, and will strengthen that fellowship among us—that *esprit de corps*—which is the soul of every professional body.

With my best wishes to yourself, and the members of the distinguished body over which it is your privilege to preside, believe me to be

Yours very respectfully,

THOMAS W. EVANS.

The President then introduced Drs. J. M. Whitney, of Honolulu, H. I., and R. H. Kimball, of Shanghai, China, who said:

DR. WHITNEY. I trust we are so nearly a part of this great country that I did not feel that my place was among foreigners. You are just about to annex us, and, wishing that that good day may come very speedily, I thank you.

DR. R. H. KIMBALL. I represent as large a country as has been called upon to speak. We have no association of dentists over there; perhaps eight American dentists are practicing between there and Singapore. I represent Asia only individually. I believe there is no one else who comes from that part of the world to this Congress. I thank you for nominating me as vice-president.

The following additional representatives were introduced at subsequent sessions of the Congress, and presented credentials or responded as follows:

DR. CHAS. E. BLAKE, of San Francisco, Cal., representative of the Dental Association of Lima, Peru.

DR. K. TAKAYAMA, of Tokio, Japan, responded on behalf of Japan.

Digitized by Google

DR. J. L. SECHER, of Copenhagen, Denmark. *Mr. President, Ladies and Gentlemen:* I have come from one of the smallest countries in the world, nevertheless we have a great many dentists in Denmark, about 300, and about seventy of them are in Copenhagen, which is about one dentist to 6,000 inhabitants. It is with me the same as with Dr. Cunningham; I have not come to represent all the dentists in Denmark, but the Society of Dentists in Copenhagen, and the Union of Dentists in Jutland and Funen, the youngest, but, I believe, the most vigorous unions of dentists in Denmark. I have the honor to present greetings from each of them to the World's Columbian Dental Congress.

Dr. W. W. Walker, of New York, introduced Dr. G. C. Daboll, of Paris, the representative of the American contingent in Europe. He was warmly received by President Shepard and the Congress.

PRESIDENT SHEPARD. We are happy to welcome this morning one, who, from his high standing and the brilliant manner in which he has maintained the honor of American dentistry in Europe, should be selected as a special guest on this occasion. He is welcome here as a representative of that large contingent which has made such a name for American dentistry throughout the world. [Applause.]

DR. DABOLL. I thank you sincerely for this reception. I assure you it was entirely unexpected. I thank you for the compliment paid to me, and if I have by my quiet efforts sustained the representation of American dentistry in Europe, I am only too thankful for the appreciation I have met here. Dentistry abroad is like dentistry in America somewhat, we have the good and the bad; we have men who sustain the profession and those who do not, but I am happy to state that there are many among the Americans abroad who uphold in the highest manner the reputation of American dentistry. Again, I thank you for this reception, and if I can have the pleasure of meeting you in Paris, ladies and gentlemen, I shall be happy to return the compliment. [Applause.]

Digitized by Google

DR. G. VARGAS PAREDES, of Bogotá, the honorary president from the United States of Colombia, was introduced and spoke as follows: *Mr. President and Brother Dentists:* In responding to the kind words of introduction of the President, I have once more the opportunity of knowing and appreciating the politeness that always distinguishes American gentlemen.

I am exceedingly thankful for having acquired my dental education in this fine country. I received it in the New York College of Dentistry, wherefor I hold grateful remembrances of my learned teacher and friend, Dr. Frank Abbott.

After some years' absence in my country I understood that my professional duties would not be faithfully fulfilled if I were not going to try to diffuse among my fellow-countrymen enough knowledge about dental science so as to contribute in any way to the welfare of mankind. With this thought in my mind I undertook to call the attention in Colombia, to the necessity of establishing meetings of dental societies in order to eliminate quackery and to appreciate, in their true value, scientific men, for I believe they are the only ones that honestly have a right to practice dentistry.

In the year 1888, I had the honor of founding a dental college in Bogotá, a school where young men, who could not afford to come to this country, would get some knowledge of dental science.

Only a few years have passed away and it is with joy I say at present that a large number of bright young men of my country, among whom are all those who received their professional education in the American dental colleges, are devoting their time to investigations in the dental line, endeavoring to sink empiricism and bring science to its true standing point.

I wish to apologize for having taken your time and attention, but I desire to show you what the harvests are from American seed, and how mankind, though indirectly, is benefited by your constant labor of mind.

Digitized by Google

I congratulate you very highly for your success in this meeting of the World's Columbian Dental Congress, and thank you very much for your having appointed me honorary president from the Republic of Colombia.

MM. CHAS. GODON and A. RONNET, representatives from the government of France, were then introduced, and M. Godon spoke as follows:

Monsieur le President, Messieurs et chers Confrères : En présence de cette nombreuse affluence de dentistes de toutes les nations reunis dans cette enceinte, nous sommes heureux de vous apporter de France notre salut confraternel et d'y joindre nos remerciments pour le bienveillant acceuil qui nous est fait. Il y a quatre ans, lorsque les délégués de vos sociétés, en venant à Paris prendre part aux travaux de notre premier Congrès, nous adressâmes une invitation à assister à une réunion qu'ils fixáient à quatre ans de distance, nous n'osions pas espérer qu'ils réaliseraient avec autant de succès leur projet.

Non pas que nous n'approuvions leur tentative, mais nous savions par expérience combien étaient nombreuses les difficultés qui pouvaient s'opposer á sa pleine réussite.

Mais le devouement de tous les collaborateurs a été à la hauteur de la tâche entreprise.

Et pour me servir d'une figure qui nous est présente à l'esprit, à nous qui venons de traverser l'Atlantique: Si le vaisseau qui portait dans ses flancs l'oeuvre du Congrès a pu eviter les seufs, triompher des orages, passer enfin au milieu des brumes sans collisions, c'est qu'il avait à son bord non seulement des officiers expérimentés, mais aussi un bon et sûr pilote, plein de science et de foi qui a sû, malgré les difficultés journalières le mener triomphalement au port.

Aussi malgré la satisfaction que doivent leur procurer le devoir accompli, permettez nous d'y joindre à notre tour nos sincères felicitations.

Nous ne pouvons pas vous cacher le grand contentement

Digitized by Google

que nous cause votre succès, car nous sommes les partisans convaincus de ces grandes assises internationales.

Nous pensons que lorsque des hommes de toutes les contrées employant leur activité dans une même voie, viennent mettre en commun les études qu'ils ont faits, les faits qu'ils ont observés, dans un même champ limité, mais sous des lattitudes et dans des milieux differents, il ne peut qu'en résulter les meilleurs résultats pour les progrès de leur art et le plus grand bien pour l'humanité.

C'est pourquoi dans notre pays nous n'avons cessé de vous donner notre entier concours dans la presse et dans nos réunions professionnelles que nous avons applaudi les délegations qui vous ont été envoyés et contribué de tout notre pouvoir à la réunion des principaux dentistes de France en une adresse adoptée le mois dernier chez notre president et ami M. Lécaudey.

Aussi lorsque le gouvernement de la République Française nous a fait le grand honneur au Prof. Ronnet et á moi, de nous charger d'une mission officielle à l'effet d'étudier l'organisation de vos écoles et de vos sociétés, nous avons en même temps, réclamé la mission officielle de venir le représenter parmi vous, afin de venir participer á vos travaux, comme étaient dejà venus le faire en 1887 nos amis Dubois et Kuhn. Mais pour que ces relations cordiales ainsi crées entre les confrères de toutes les nations se perpetuent, permettez moi en terminant de reprendre le voeu dejà emis par nous à Paris en 1889:

"Que dans des circonstances semblables à celle où la ville et les dentistes de Chicago nous offrent une si grandiose hospitalité, il soit institué de semblables réunions et persuadé que les dentistes de France voudront donner l'exemple. Je vous invite dès maintenant au Congrès Dentaire International de Paris en 1900."

DR. FRED. J. CAPON, of Toronto, Canada, on being introduced responded in behalf of the Dominion of Canada.

DR. L. C. BRYAN, of Basle, Switzerland, said: As representative of the American Dental Society of Europe, I

Digitized by Google

have nothing particular to say. Dr. Evans' letter, which has been read, expressed the feelings of that society, as well as the foreign contingent, of which I am one of the vice-presidents. I am glad to thank the dentists of Chicago and the administration of this congress, the committees and those who have so generously provided for our entertainment here, and so hospitably received us. I think all the foreign members will join me in thanking them, and expressing our gratitude for the success of the Congress.

The first session was prolonged nearly two and one-half hours. More than twelve hundred persons were present at the opening meeting.

Digitized by Google

SECOND DAY, TUESDAY, AUGUST 15.

The session was opened at 12 o'clock.

The President then introduced Dr. Otto Zsigmondy, of Vienna, Austria, who read a paper entitled "Congenital Defects of Enamel."

BEITRÄGE ZUR KENNTNISS DER ENTSTEHUNGSURSACHE DER HYPOPLASTISCHEN EMAILDEFECTE.

VON OTTO ZSIGMONDY, M.D., WIEN.

Ziemlich häufig, nach Busch, bei etwa zwei Procent sämmtlicher Menschen findet sich jene auffälliage Anomalie der Zahnschmelzbildung, welcher man in Ermangelung einer bessern Bezeichnung die unpassenden Namen „Erosion" oder „Atrophie" gegeben hat. Einige Autoren behaupten, dass das eigentliche Bild der mangelhaften Schmelzentwicklung nur an den Zähnen der bleibenden Reihe zur Beobachtung gelangt, dass die Milchzähne hingegen niemals die typischen Defecte aufweisen. Diese Annahme beruht aber auf einem Irrthume. Man sieht, wenn auch nicht allzu oft, so doch gelgentlich, temporäre Zähne, welche nicht nur was äussere Form anlangt die Eigenthümlichkeiten der missgebührlichen permanenten Zähne besiten, sondern deren Textur auch die Spuren jener Unterbrechung in der Entwicklung zeigt, welche, wie später ausgeführt werden soll, für die in Rede stehenden Schmelze characterisirt sind.

In der Reihe der bleibenden Zähne treten die genannten Anomalien der Zahnschmelzbildung nicht gleichmässig auf, und zwar finden sich die Zähne der frühesten Entwicklung am häufigsten, die der spätesten Entwicklung am seltensten befallen. Man trifft dementsprechend den ersten Molar, der vom permanenten Zahnsatz zuerst verkalkt, auch am häufig-

Digitized by Google

sten mit rudimentär gebliebenem Email. Ihm zunächst kommen die Frontzähne (Schneide- und Eckzähne) [in der später zu erwähnenden Reihenfolge]. Weit seltener ist die Affection beim ersten Backzahn, noch seltener beim zweiten Backzahn, während ich von den beiden letzten Mahlzähnen niemals einen ausgesprochen hierhergehörigen Fall gesehen habe.

Der Schmelzüberzug der mit dieser Affection behafteten Zähne is ungleichmässig vertheilt. In den geringsten Graden zeigen sich nur an einzelnen Stellen der sonst anscheinend normalen Emailoberfläche vereinzelt oder in Reihen auftretend mehr oder minder tiefe Grübchen. In höheren Graden, wo die Grübchen confluiren, entstehen Furchen, welche quer um die ganze Krone herumlaufen können. Manchmal sieht man zwei oder mehrere solcher Furchen etagenweise übereinander (geriefter, welliger Schmelz). In anderen Fällen, wenn jede Furche in eine Reihe von Grübchen aufgelöst erscheint, präsentirt sich der Schmelz wie mit Grübchen übersät (die „honeycombed teeth" der Engländer). Bei noch anderen scheint der Emailüberzug an gewissen Stellen gänzlich zu fehlen und das Zahnbein zu Tage zu liegen („erosion en échancrure" oder „erosion en nappe" von den französischen Autoren genannt, wenn der Defect in grösserer oder geringerer Ausdehnung den freien Rand der Schneiden der vorderen Zähne betrifft).

Das die Gruben auskleidende Email besitzt eine unebene, rauhe Oberfläche, eine mehr oder minder gelbliche bis bräunliche Farbe und entbehrt des ihm sonst zukommenden Glanzes und der normalen Transparenz, während im Gegensatze hiezu die unmittelbar angrenzenden Partien des Schmelzüberzuges häufig alle Kennzeichen des vollkommen ausgebildeten Schmelzes besitzen. Bei jenen Zähnen, bei welchen das Zahnbein zu Tage liegt, oder nur von einer sehr dünnen Emailschichte bedeckt ist, springt der Schmelz des normalen Theiles der Krone in Form eines Wulstes vor, sodass einige Autoren hiedurch veranlasst wurden, von besonders massiger Ablagerung, von Verdickungen des Schmelzes an diesen Stellen zu sprechen. Wie man sich aber an Durchschnitten

Digitized by Google

derartiger Zähne überzeugen kann, findet eine eigentliche Verdickung der Schmelzschichte, ein Hinausgehen in dieser Beziehung über die Norm, niemals statt.

Während auf dem Durchschnitte die Oberfläche des Schmelzes den Gruben und Furchen entsprechend eingetieft erscheint, zeigt sich die Zahnbeingrenze im Gegensatz hiezu im Allgemeinen nicht verändert. In der Emailkappe wechseln somit dünnere mit normal dicken Partien ab. Stellen, an denen gar kein Schmelz zur Entwicklung kam, finden sich nur sehr selten. Auch da, wo man entsprechend der Tiefe der Furche das Zahnbein zu Tage liegend vermuthen würde, ist eine, wenn auch zuweilen sehr dünne Schmelzlage vorhanden. Ganz des Schmelzes entbehrende Zahnbeinstellen verfallen in der Regel bald der Caries, umsomehr als das Zahnbein dieser Zähne an seinen den Schmelzdefecten entsprechenden Partien eine das Fortschreiten der Erkrankung in hohem Masse begünstigende, fehlerhafte Structur besitzt.

Wesentlich für die Natur der in Rede stehenden Defecte ist jedoch nicht nur das Bild, welches ein einzelner missbildeter Zahn besitzt, sondern insbesondere die Art der Verbreitung der Difformitäten über das ganze Zahnsystem in topologischer Hinsicht. Einerseits nämlich ist die Vertheilung der Schmelzdefecte eine symmetrische, sodass im Oberkiefer sowohl als im Unterkiefer auf beiden Seiten die gleichen Zahnsorten, und zwar in gleicher Weise, behaftet erscheinen. Andrerseits finden sich die Defecte bei den sämmtlichen Zähnen, welche als einer und derselben Bildungsstufe angehörig erkannt worden sind, und bei ihnen überdies auf jene Theile der Schmelzdecke beschränkt, welche in demselben Stadium der Entwicklung standen. Zeigen sich zum Beispiel nur die zeitlich zuerst entwickelten Partien der Höcker der vier ersten Mahlzähne afficirt, die dann wie abgestumpft erscheinen, so sind die übrigen Zähne von den Difformitäten frei. In der That gehört auch die Verkalkung der letzteren einer späteren Periode an. Treten hingegen die Difformitäten an Partien der ersten Mahlzähne auf, welche sich erst später entwickeln, nachdem die Bildung an den Höckern der ersten Mahlzähne schon weiter vorge-

Digitized by Google

schritten ist, zeigt sich also der Defect mehr gegen die Wurzel hin, so erscheinen auch die mit diesen Partien in Bezug auf Verkalkung gleichzeitigen Stellen der centralen Scheidezähne mit einem mangelhaften Emailüberzug versehen. Wenn endlich beim ersten Molar eine Furche in der Nähe des Schmelzrandes vorhanden ist, wird sich ein analoger Defect in der halben Höhe der Krone des centralen Schneidezahnes zeigen, während der erste Bicuspidatus und die später verkalkenden Zähne gänzlich frei geblieben sind.

Es können in demselben Gebiss auch mehrere derartige Reihen zusammengehörender Defecte, welche je einer Entwicklungsperiode entsprechen, gleichzeitig vorhanden sein.

Die Beobachtung, dass die an verschiedenen Zähnen auftretenden Anomalien des Schmelzes sich nur an solchen Stellen finden, welche als derselben Entwicklungsstufe angehörend bekannt sind, legt den Gedanken nahe, dass je einer Reihe von Defecten als gemeinsame Ursache eine Entwicklungsstörung zu Grunde liegt, welche den gesammten Zahnapparat zu einer bestimmten Zeit befallen hat. In der That ist diese Annahme bereits gemacht worden, und mit ihr stehen auch, wie ich später zeigen werde, die Ergebnisse der Untersuchung der Textur des Schmelzes im Einklang.

Ehe ich aber auf die Besprechung dieser Verhältnisse näher eingehe, möchte ich an dieser Stelle eine interessante Folgerung aus der genannten Hypothese vorwegnehmen. Wenn nämlich in der That einer Difformitätenreihe eine bestimmte, gemeinsame schädigende Ursache zu Grunde liegt, so müssen die Spuren derselben sich an allen Stellen der gleichen Entwicklungsstufe des Gebisses vorfinden, sodass man aus dem Auftreten dieser Schmelzanomalien einen Einblick in die Zeitfolge der Verkalkung selbst jener Zähne gewinnen kann, deren Stellung in dem Entwicklungsgange bisher noch nicht genügend erforscht ist. Auf diesem Wege kann man erschliessen, dass der laterale Schneidezahn sich im Oberkiefer anders als im Unterkiefer verhält. Während er in letzterem dem centralen Schneidezahn nachfolgt und dem Eckzahn vorhergeht, ist im Oberkiefer die Reihe der Verkalkung folgende: 1) centraler Schneidezahn, 2) Eckzahn,

Digitized by Google

3) lateraler Schneidezahn. Man sieht nämlich bei mit Emaildefecten behafteten Gebissen im Oberkiefer sehr häufig den lateralen Schneidezahn fast ganz normal entwickelt zwischen den mit rudimentärem Schmelze bedeckten Kronen des centralen Schneidezahnes und des Caninus stehen. Auf die nähere Erörterung dieser Verhältnisse will ich nicht weiter eingehen, da die nöthigen Belege verabredetermassen in einer demnächst zu publicirenden Arbeit meines Freundes Dr. G. Cunningham in Cambridge (England) gebracht werden sollen.

Die Frage nach der Aetiologie dieser Difformitäten ist bekanntlich schon oft Gegenstand lebhafter Discussion gewesen. Nachdem sich die Formanomalie fast niemals auf einen einzelnen Zahn beschränkt, was auf eine locale Ursache hindeuten würde, sondern in der weitaus grösseren Mehrzahl der Fälle über das ganze Zahnsystem sich erstreckt, sieht man sich, wie bereits erwähnt, dazu gedrängt, eine Erkrankungsursache des gesammten Organismus zur Zeit der Verkalkung der Zahnkeime als Ursache anzunehmen, deren Spuren in sämmtlichen übrigen Geweben des Körpers verschwunden, in den Zähnen jedoch erhalten geblieben sind. Krankheiten mannigfachster Art, Rachitis, Skrophulose, Syphilis, die acuten Exantheme, Eklampsie, Meningitis, schwere Anfälle von Erstickung, wie sie z. B. durch Keuchhusten hervorgerufen werden, sind als Veranlassung der Störung des normalen Entwicklungsganges innerhalb des Zahnfollikels angegeben worden. In dem beschränkten Rahmen meines heutigen Vortrages ist es nicht thunlich, die Argumente, welche für die aufgestellten Theorien angeführt werden, einer eingehenden Besprechung zu unterziehen und auf die einander widersprechenden Ansichten der einzelnen Forscher des Näheren einzugehen. Es sei mir nur die eine Bemerkung gestattet, dass zu einer exacten Begründung einer auf Beobachtung der äusseren Verhältnisse des Emails fundirten Hypothese, wie es die angeführte der Entwicklungsstörung ist, die Beantwortung der Frage nöthig wäre, ob sich Spuren der stattgehabten Einwirkung der Schädlichkeit auch thatsächlich bei allen gleichzeitig in Entwicklung stehenden Schmelz-

Digitized by Google

partien, bei allen gleichzeitig verkalkenden Emailprismen, nachweisen lassen können. Ein derartiger Nachweis lässt sich nur durch die microscopishe Untersuchung der Structur des Schmelzes hypoplastischer Zähne erbringen, wie denn überhaupt eine genaue Kenntniss ihrer Textur erst eine sichere Basis für die Erörterung der Frage nach der Ursache der Defecte abgeben kann. Es muss daher bei dem beträchtlichen Umfange der einschlägigen Literatur einigermassen Wunder nehmen, dass die microscopische Untersuchung der mit Schmelzdefecten behafteten Zähne so sehr vernachlässigt wurde.

Als Hauptergebniss der bisherigen Forschung in dieser Beziehung muss der Nachweis angeführt werden, dass die Störung in der Entwicklung sich nicht allein auf den Schmelz beschränkt, sondern auch im Zahnbein zu bemerken ist. Dasselbe ist nicht durch und durch gleichmässig verkalkt. Man beobachtet nämlich im Dentin, übereinstimmend mit der Lagerung der Bildungsschichten desselben, deutlich ausgeprägte Contourlinien, welche aus reihenweise angeordneten, zuweilen sehr mächtigen Interglobularräumen bestehen. Die Contourlinien sind der Durchschnitt von Schichten, in welchen unter dem Einflusse der den normalen Entwicklungsgang störenden Ursache an der ganzen Oberfläche der Zahnpapille nur eine unvollkommene Verkalkung der Zahnbeingrundsubstanz stattgefunden hat.

Die wenigen, auf den Bau des mangelhaft entwickelten Schmelzes sich beziehenden Angaben in der Literatur seien im Nachfolgenden zusammengestellt. In seiner „Pathologie der Zähne," 1870, p. 107, sagt Wedl:

„Die Schichtungen des gerieften Schmelzes halten sich adäquat den staffelförmigen Absätzen, d. h. sie ziehen in zur Oberfläche parallelen Ebenen von einem Absatze zum andern und beschreiben im Längsschnitt der Krone besehen concentrisch liegende Bogensysteme. Da, wo eine quere Einfurche sich findet, lehnt sich unterhalb derselben das von der Schneide oder Spitze der Krone entferntere, in der Horizontallage hintere Schichtensystem an seinen vordern Nachbarn. An der Einbuchtung ist gemeiniglich eine sehr ausgeprägte Pigmentirung vorhanden.

„Die histologischen Merkmale mangelhaft gebildeten

Digitized by Google

Schmelzes geben sich durch körnige Trübe einzelner Schmelzpartien zu erkennen, wobei seine Textur mehr oder weniger untergegangen ist und unregelmässige zackige Begrenzungen gegen den normal entwickelten Schmelztheil sich zeigen. Hiemit steht die geringere Widerstandsfähigkeit, das leichte Abbröckeln des Schmelzes, im Einklang. Sehr häufig trifft man dunkelbraune oder schwarzbraune Pigmentirungen, welche die Textur der Schmelzstellen stellenweise ganz undeutlich machen. Die Grübchen im Schmelz münden an der Oberfläche mit einer weiten Öffnung oder haben in seltenen Fällen eine halsähnliche Einschnürung. Die ganze innere Oberfläche ist mit Schmelz ausgekleidet, der mit Ausnahme der Stellen seiner Prismen von normaler Beschaffenheit sein kann. Ist der Schmelz insbesondere in seinen peripheren Lagen trübe, so ist seine Bildung grösstentheils in einer körnigen, verkalkten Masse untergegangen."

Baume schreibt (Die Defecte der harten Zahnsubstanzen, Leipzig, 1882, p. 9) bei Schilderung der ersten Gruppe der mit angeborenen Schmelzdefecten behafteten Zähne, welche jene umfasst, bei denen nur einige Grübchen bestehen: „Der Schmelz der Umgebung (des Defectes) ist unregelmässig gebildet; die Prismen sind an den betreffenden Partien undeutlich. Die defecte Stelle selbst ist gewöhnlich mit einem mit blossem Auge kaum erkennbaren Schmelzüberzuge versehen. Dieser Schmelz lässt von einer Struktur häufig nichts erkennen." Dasselbe gilt für die zweite Form der Defecte, bei denen statt eines Grübchens viele in einer Reihe auftreten oder eine tiefe Furche besteht. Wenn ein grösserer Theil des Zahnes nur mit einer rudimentären, ganz dünnen Schichte von Schmelz bedeckt ist, ist derselbe von amorphen Stellen durchsetzt und nur an wenigen Stellen annähernd normal gebildet."

O. Walkhoff (Ein Beitrag zur Lehre der Contourlinien und zur Physiologie des Zahnbeins, *Deutsche Monatsschrift für Zahnheilkunde*, 1885, p. 576) gibt bei Besprechung des microscopischen Befundes der Schneidezähne eines alten Mannes, die in hohem Grade die characteristischen Eigenschaften des welligen Schmelzes besassen, bei denen auch der Cement in seiner ganzen Ausdehnung dieselbe Wellenform zeigte, folgendes über die Textur des Schmelzes an: „Der Schmelz ist sehr mangelhaft angelegt. Wir finden eine grosse Anzahl von 'braunen Linien' Retzius', welche Kölliker als Zeichen einer schichtweisen Ablagerung des Schmelzes ansieht. Ausserdem sind grosse Partien des letzteren nur sehr wenig verkalkt, und stark pigmentirt."

In Ch. S. Tomes (A System of Dental Surgery, 1887,

Digitized by Google

p. 132) findet sich die Bemerkung, dass das Gewebe des Schmelzes porös, gelb, opak, und sehr gebrechlich sei.

Die ausführlichsten Angaben über die Structur des mangelhaft gebildeten Schmelzes verdanken wir Frank Abbott (Congenital Defects in Enamel, *Dental Cosmos*, 1891, p. 605). Die Emailprismen zeigen sich nach diesem Autor in mangelhaft ausgebildetem Schmelz stark wellig und durch schwach angedeutete concentrische Streifen unterbrochen. In das Email dringen zahlreiche birnförmige Verlängerungen der Zahnbeincanälchen, die sich zuweilen fast bis zur Oberfläche erstrecken. Diese enthalten Protoplasma und werden durch Goldchlorid tief violet gefärbt. An einzelnen Stellen sieht man körnig getrübte Lagen von Email, wo dasselbe nicht genügend calcificirt ist. Ausserdem bildet Abbott den Längsschliff durch die Höcker einer Mahlzahnkrone, wo anomal gebildetes Email auf normalem abgelagert erscheint. An der Grenzlinie zwischen den beiden Theilen nehmen die Emailprismen plötzlich eine andere Richtung an, indem ihr bis dahin longitudinaler Verlauf mit einem Male in einen queren sich verwandelt. Einige Prismen sind auch schief getroffen. Eine Unzahl körniger Gebilde durchsetzt den dem normalen aufgelagerten Theil. Dieselben sind theils in Reihen angeordnet, theils finden sie sich unregelmässig zerstreut. In einem andern Falle ist das Umgekehrte eingetreten. Fehlerhaftes Email wurde zuerst gebildet und auf dieses solches von normaler Textur aufgelagert. Im anomalen Theile sieht man mehrere Lagen von äusserst schmalen, unterbrochenen Prismen; von einer gewissen Grenze ab erscheinen Prismen von normalem Querschnitt, die zuerst quer und dann longitudinal verlaufen.

Was wir vor Allem in der Literatur vermissen, das ist die Beantwortung der Frage, ob sich Spuren der stattgehabten Entwicklungsstörung in *allen* zur Zeit des Eintritts der Schädlichkeit verkalkenden Schmelzprismen zeigen, einer Frage, welche von wesentlicher Bedeutung für die Erkenntniss der Natur der behandelten Defecte ist. Diesbezüglich angestellte Untersuchungen, von deren Resultat Mittheilung zu machen der Hauptzweck dieses Vortrages ist, haben in der That ergeben, dass ein solches Analogon der Contourlinien des Zahnbeins im Schmelz sich vorfindet. Der Längsschliff eines Zahnes, der mit der einfachsten Form von Emaildefect, einer rings um die Krone herumlaufenden

Digitized by Google

Furche, behaftet ist, zeigt (*vide* Fig. I.), dass die Schmelzlage sich von der Kronenspitze gegen die Wurzel zu allmählig verschmälert, bis die tiefste Stelle der Einsenkung erreicht ist, wo der Schmelz nur eine geringe, in den einzelnen Fällen variirende Mächtigkeit besitzt. Geht man in derselben Richtung (gegen die Wurzel zu) weiter, so sieht man, dass der Schmelz sehr rasch wieder die ihm normal zukommende Dicke erlangt. Die äussere Begrenzungslinie nähert sich somit in der Richtung von der Krone gegen die Wurzel zu allmählig der Oberfläche des Zahnbeins, um dann plötzlich scharf nach aussen abzubiegen. In directer Fortsetzung des erstern, dem Zahnbein sich nähernden Theiles der Begrenzungslinie und in gleicher Richtung mit ihr, gewahrt man, wenn der Schliff genügend dünn ist, von der tiefsten Stelle der Einsenkung aus eine feine, scharf ausgeprägte Linie, welche die ganze Schmelzbreite durchsetzt und bis zur Zahnbeinoberfläche sich verfolgen lässt. Gegen die letztere ist diese Linie unter einem Winkel von fünfzehn bis zwanzig Grad geneigt. Die Richtung ihres Verlaufes ist somit im Ganzen dieselbe, wie die der „bräunlichen Parallelstreifen von Retzius," welche ziemlich häufig in grösserer Anzahl im benachbarten Schmelzgewebe vorkommen, von der behandelten Linie aber durch characterische Eigenschaften unterschieden sind. Analog sieht man an geeigneten, wurzelwärts von den Defecten genommenen Querschliffen eine Linie parallel zur Oberfläche des Schmelzes um die ganze Zahnkrone herumziehen.

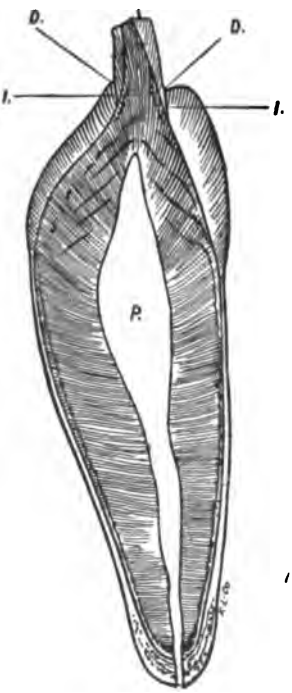


FIG. I.
(Schematische Zeichnung.)
D. Defect.
I. Unterbrechungslinie.

Die Stellung dieser im Querschnitte auftretenden Linie

Digitized by Google

zu der im Längsschliffe beobachteten ist eine derartige, dass man beide als Schnittcurven ein und derselben Fläche ansehen muss, welche die früher gebildete Schichte des Emails von der später abgelagerten scheidet. Im Zusammenhalt mit den oben angedeuteten Gründen wird man nicht fehlgehen, diese Fläche als die im Schmelze gesuchte Spur der angenommenen Entwicklungsstörung anzusehen, sodass sie als die Verkalkungsgrenze des in der Entwicklung befindlichen Schmelzes zur Zeit des Eintrittes der die Defecte verursachenden Störung bezeichnet werden muss.

Betrachtet man die Durchschnitte von normal sich entwickelnden Zähnen, und beobachtet die Begrenzungslinien, welche durch die jüngste Ausbildung des Schmelzes entstanden sind, so findet man, dass die Schmelzkappe an dem freien Ende der Krone, an der Schneide oder Spitze, wo die Verkalkung beginnt, die grösste Dicke erlangt hat, und gegen die Wurzel zu sich allmählig verschmälert. Die den ersteren Partien entsprechenden Schmelzprismen sind schon bis zu einem grossen Theile ihrer Länge ausgebildet, während die Prismen in den abhängenden Theilen noch nicht so weit vorgeschritten sind, und die in den noch weiter von der Kronenspitze entfernten die Zahnbeinenden der Schmelzprismen eben erst angelegt erscheinen. Die von da gegen den Umschlagsrand des innern in das äussere Epithel des Schmelzorganes zu gelegenen Schmelzquellen haben noch nicht mit der Bildung des Schmelzes begonnen. Tritt nun die die Schmelzdefecte verursachende Schädlichkeit ein, so gehen jene Schmelzquellen, welche die älteren, bereits über eine gewisse Länge hinaus verkalkten Prismen gebildet haben, zu Grunde, wodurch die Fortentwicklung dieser Prismen unmöglich gemacht wird und ihnen entsprechend der Defect sich zeigt. Die noch nicht so weit ausgebildeten Prismen der weiter gegen die Wurzel zu gelegenen Schmelzpartien erleiden allerdings auch eine Unterbrechung in ihrer Verkalkung, von der sie eine bleibende Marke, die oben nachgewiesene Verkalkungsgrenze, davontragen, wachsen aber, nachdem der schädliche Einfluss aufgehört hat, wirksam zu sein, weiter aus und können, falls sie nicht durch

Digitized by Google

eine neuerliche Schädlichkeit in ihrer ferneren Entwicklung gehindert werden, in manchen Fällen die ihnen normal zukommende Länge erreichen. Bei jenen Schmelzprismen, welche gegen den Zahnhals zu gelegen und bei welchen die Verkalkung zur Zeit des Eintrittes der Schädlichkeit noch nicht begonnen hatte, geht die Ausbildung in vollkommen normaler Weise vor sich.

Die Richtung und Anordnung der Emailprismen scheint bei durch die Längsachse radial und tangential zum Zahn-

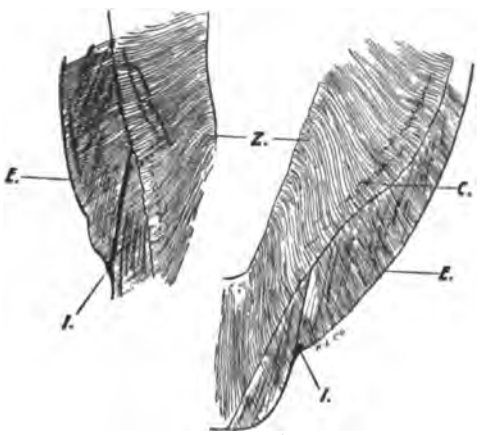


FIG. II. (O. I. Obj. Hart.)

Radialer Längsschliff d. einen obern Schneidezahn mit rings um die Krone verlaufendem Defect.

Z. Dentin; C. Contourlinien; E. Email; I. Unterbrechungslinie vom Defect ausgehend u. den ganzen Schmelz durchsetzend.

bogen geführten Schnitten vor und hinter der Unterbrechungslinie nicht erheblich alterirt (*vide* Fig. II). Bei manchen Schnitten, die parallel zur Längsachse, aber ziemlich peripher, im Zahne genommen wurden, zeigt es sich, dass die Emailprismen an der Unterbrechungslinie eine andre Verlaufsrichtung annehmen. Am schönsten kann man dies wahrnehmen, wenn man die Schliffe nach dem Vorgange von Linderer mit Salzsäure anätzt, welcher Methode ich mich auf Anrathen Professor von Ebner's bediente. Die Hunter-Schreger'schen Faserstreifen, welche auf einer

Digitized by Google

entgegengesetzten Verlaufsrichtung beruhen, ziehen in der normalen Weise von der Zahnbeinoberfläche gegen die Unterbrechungslinie, um an ihr plötzlich aufzuhören. Jenseits der Linie sieht man die Prismen quer und schief getroffen, die eigenthümliche Anordnung derselben, welche den Hunter-Schreger'schen Faserstreifen zu Grunde liegt, ist aber nicht mehr vorhanden (Fig. IV bei X). Weiter gegen die Wurzel zu, wo das Gewebe seinen Aufbau vom Anfang bis zum Ende ungestört durchführen konnte, sieht man die Schreger'schen Streifen schön ausgebildet die ganze Schmelzbreite durchsetzen (Fig. IV bei S^1).

Durch Untersuchung von beinahe fünfzig Schliffen, die Zähnen mit mangelhaft ausgebildeter Schmelzdecke entnommen waren, habe ich mich überzeugt, dass die beschriebene Unterbrechungsfläche ein constanter Befund bei allen Formen der in Rede stehenden Bildungsdefecte des Schmelzes ist.

Wenn die Oberfläche einer Zahnkrone zwei oder mehrere quere Einfurchungen aufweist, so sieht man die Schmelzlage auf dem Längsdurchschnitte durch die von den Einbuchtungen zur Oberfläche des Zahnbeins ziehenden Linien in ebensoviel Schichten zerlegt, als wulstförmige Vorsprünge vorhanden sind. Auch da, wo der Schmelzdefect nur in einer grübchenförmigen Einsenkung besteht, in welchem Falle die Erklärung des Zustandekommens desselben sich schwieriger gestaltet, findet man die Unterbrechungslinie. Sie verhält sich bei den Längsschliffen, die durch die Grube geführt werden, genau so wie bei jenen Fällen, wo eine Furche um die ganze Krone herumzieht. Bei Querschliffen sieht man, dass die Linie vom Grunde eines solchen Grübchens aus sich nach beiden Seiten hin erstreckt, um die ganze Krone herumläuft und die Schmelzlage in einem innern, früher gebildeten und einem äussern, erst später angelagerten Gürtel trennt (Fig. III). Längschnitte, die durch den seitwärts der Grube befindlichen, anscheinend normal ausgebildeten Schmelz geführt werden (Fig. VI a b), zeigen, dass die Unterbrechungslinie das hier normal dicke Email durchsetzt und weiter gegen die Spitze der Krone zu, als das

Digitized by Google

Grübchen sich befindet, in einer oft sehr unbedeutenden, manchmal sogar fehlenden Depression die Schmelzoberfläche erreicht (Fig. IV). Die Frage, was für Verhältnisse dafür massgebend sind, dass die dem Grübchen entsprechenden Schmelzzellen zu Grunde gehen, während die benachbarten, derselben Zone angehörigen Prismen nur eine Unterbrechung ihrer Entwicklung erleiden und trotz des Einflusses der Schädlichkeit, nachdem dieselbe gewichen ist, sich bis zu ihrer normalen Länge ausbilden können, will ich hier nicht

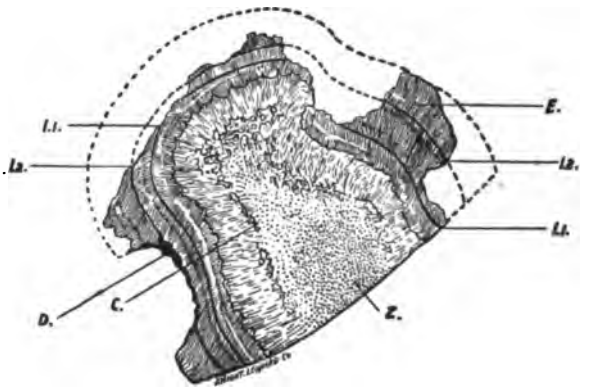


FIG. III. (Vergr. O. I. Ob. 3.)

Querschliff durch den Fig. V abgebildeten Eckzahn.

Z. Dentin; C. Interglobularräume; E. Email; D. Grübchen im Schmelz; I_1. Unterbrechungslinie einer ältern Entwicklungsstörung entsprechend; I_2. Unterbrechungslinie der Störung entsprechend, welche das entstehen des Grübchens D veranlasste.

weiter behandeln, da ich darüber blosse Vermuthungen aussprechen könnte.

Ich wende mich jetzt zur Erörterung der Frage, ob der hier dargelegte Befund geeignet ist, auf unsre Anschauungen über die Aetiologie der Schmelzdefecte modificirend einzuwirken. Ich will mich über diesen Punkt ganz kurz fassen. Es scheint, dass die Störung in der normalen Entwicklung, welche die Defecte verursacht, in der weitaus grösseren Mehrzahl der Fälle eine plötzlich eintretende und plötzlich wieder schwindende ist. Es könnte sonst nicht erklärt wer-

Digitized by Google

...ersity of Calif...

den, dass die Structur des Emails, die Anordnnng der Prismen von der Zahnbeinoberfläche bis hart an die Unterbrechungslinie heran, vollständig normal ist und auch jenseits der Linie in dem später gebildeten Email, wenn man von der in manchen Schliffen sich zeigenden, veränderten Anordnung der Prismen absieht, ebenfalls keine bedeutenden Störungen im Aufbau des Gewebes vorkommen.

Der Umstand, dass die im Emailgewebe sichtbare Tren-

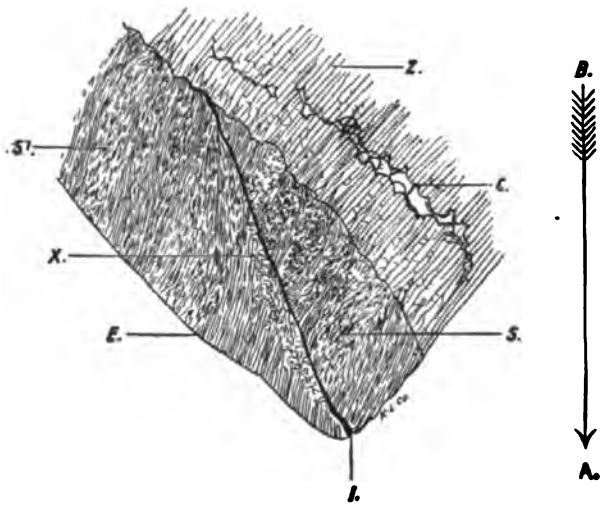


FIG. IV. (A. 3. Obj. 7 Hart.)
Längsschliff durch a b in Fig. VI.

A. Richtung gegen die Krone; B. Richtung gegen die Wurzel; Z. Dentin; C. Interglobularräume; E. Schmelz; S. Schreger'sche Streifen durch die Störungslinie unterbrochen; I. Störungslinie; S^1. Schreger'sche Streifen durch die ganze Dicke des Schmelzes verlaufend.

nungslinie bei Durchschnitten senkrecht auf die der Entwicklungsstörung entsprechende Fläche ausserordentlich fein ist, scheint darauf hin zu deuten, dass auch die Dauer der Einwirkung der Schädlichkeit, welche die Defecte verursacht, eine sehr kurze ist.

Dass die Intensität des Anfalles einen Einfluss auf die grössere oder geringere Ausdehnung der Defecte haben wird, ist wohl klar. Prismen, die unter minder günstigen Umstän-

Digitized by Google

den sich weiter entwickelt hätten, gehen, wenn die Schädlichkeit eine bedeutendere ist, ebenfalls zu Grunde. Nachdem wir jedoch trotz der in Rede stehenden Schmelzdefecte so selten Zähne finden, bei denen der Defect bis auf das Zahnbein reicht, wo also stellenweise vollständiger Schmelzmangel zu constatiren ist, muss angenommen werden, dass Prismen, die erst eine geringe Länge erreicht haben, verhältnissmässig wenig unter jenem schädlichen Einflusse zu leiden

FIG. V. (Dop. Natür. Gr.) Oberer Eckzahn, vom dem der Querschliff, Fig. III, entnommen ist.

FIG. VI. (Dop. Natür. Gr.) Unterer Schneidezahn, vom dem der Längschnitt, Fig. IV, entnommen ist.

haben, welcher der Weiterentwicklung der älteren, schon zu einer grösseren Länge ausgebildeten Prismen so leicht und so oft ein Ziel setzt.

Zum Schlusse kann ich nicht umhin, noch einige Worte über die Bezeichnungen einzuschalten, welche den besprochenen Schmelzdefecten beigelegt wurden. Benennungen, die für eine grosse Anzahl derselben passen würden, wie "honeycombed teeth," „welliger Schmelz," „geriefte Zähne" und ähnliche, sind nicht in allen Fällen zutreffend. Die Bezeichnungen „rachitische" oder „syphilitische Zähne" müssen

Digitized by Google

desswegen zurückgewiesen werden, weil es fraglich ist, ob diese im Namen angedeuteten Leiden überhaupt jemals Schmelzdefecte veranlassen können. Dass der Name „Atrophie" nicht correct ist, wurde schon oft hervorgehoben. Dieser würde eine Rückbildung normal angelegter und gut ausgebildeter Theile bedeuten, aber nicht eine ursprünglich mangelhafte Bildung, um die es sich hier ja handelt. Ebenso verwerflich aber ich auch die Bezeichnung „Erosion," welche sich einer solchen Beliebtheit in der Literatur erfreut und deren sich nach dem Vorgange der Franzosen die Majorität der neueren Autoren bedient. „Erosion" würde „Ausnagung" bedeuten. Von einer solchen, wie überhaupt von der Entstehung der Defecte durch eine mechanische Einwirkung kann natürlich nicht die Rede sein. Der Ausdruck Erosion für die mangelhafte Bildung des Schmelzes ist umsoweniger am Platze, als wir correcturweise die keilförmigen Usuren an den Zahnhälsen, welche durch den Gebrauch zu scharfer Zahnpulver etc. entstehen, mit demselben Namen belegt finden. Ich möchte mir erlauben, in dieser Beziehung einen Vorschlag zu machen. Die pathologische Anatomie bezeichnet den Zustand, wenn einzelne Organe oder Organtheile aus äusserer oder innerer Ursache mangelhaft gebildet werden und sie in Folge dessen abnorm klein und kümmerlich sind, als eine Hypoplasie. Wir werden demnach hier, wo diese Verhältnisse zutreffen, von einer Hypoplasie des Schmelzes zu reden haben.

Gestatten Sie, meine Herrn, dass ich der Hoffnung Ausdruck gebe, es möge mir gelungen sein, ihre Aufmerksamkeit auf die grosse Verwendbarkeit und auf die Nothwendigkeit microscopischer Untersuchung des Emails bei Arbeiten über Hypoplasie des Schmelzes gelenkt zu haben. An diese Hoffnung füge ich den Wunsch, dass eingehende Forschung auf diesem Gebiete bald volle Klarheit über die Ursache dieser interessanten Anomalie bringen möge und damit unsre Kenntniss des vielfach dunkeln und complicirten Entwicklungsganges unsres Zahnapparates und der störenden Erkrankungen, denen er unterliegt, eine weitere, werthvolle Bereicherung erfahre.

Digitized by Google

DISCUSSION.

DR. J. J. R. PATRICK, of Belleville, Illinois. I would like to ask the essayist if he has ever observed the crescentic form in the deciduous teeth, the so-called Hutchinson's syphilitic teeth? I never have, and I would like to know if any other member has, as I have disclaimed that this crescentic form of defective enamel is produced by hereditary syphilis. If it is, we must certainly expect to find this form of defect in the deciduous series; if not, then it cannot be attributed to that disease.

DR. ZSIGMONDY. I have observed just the same defects in the deciduous set as in the permanent set. I have passed around a bottle containing two cuspids of the deciduous set, where defects appear just as in the permanent teeth, and which exhibit the same characteristic microscopic structure.

DR. PATRICK. Did you ever observe the crescent form, the so-called Hutchinson's tooth?

DR. ZSIGMONDY. Yes.

DR. G. V. BLACK, of Jacksonville, Illinois. The question is this, as I understand it, Has the gentleman observed the atrophy of the middle lobe of the central incisors, producing the crescentic appearance described by Mr. Hutchinson as being characteristic of syphilis?

DR. ZSIGMONDY. No, I have not seen it in the deciduous central incisors. These teeth are much more liable to decay; but you will find here, if you examine the cuspids which I have exhibited, just the same effect as you find in the permanent teeth. I have made microscopic slides, and I find the same line of interruption as in the permanent set. This was not, however, in a syphilitic case.

DR. PATRICK. What was the age of the patient when those teeth were extracted?

DR. ZSIGMONDY. Ten years.

DR. PATRICK. We all know if there are any congenital defects in the enamel of the deciduous or the permanent teeth, they must have their origin when that enamel is forming. If hereditary disease is the cause of such defective enamel, it must necessarily affect the deciduous teeth first.

Digitized by Google

That is the point I wish to make. All eruptive diseases during gestation must necessarily affect the enamel of the deciduous teeth if those eruptive diseases take place during the formative process of the enamel. Can it be otherwise? I have already put on record three very remarkable cases —the effect of eruptive diseases on the enamel.

DR. L. L. DAVIS, of Chicago. Do I understand Dr. Patrick that his question to the essayist implied that this condition was not found in the temporary teeth?

DR. PATRICK. I want to know whether he ever observed the crescentic form.

DR. DAVIS. I have a case in my practice at the present time, a child, who has the Hutchinson notch very clearly defined. The child is twenty months old. I simply mention this case for the benefit of Dr. Patrick.

DR. GEORGE CUNNINGHAM, of Cambridge, England. I think that we ought not to allow a paper of this kind to pass without some acknowledgment of the position that it has taken. I think any one who has been able to follow Dr. Zsigmondy's paper will have noticed that he has not at all gone into the question as to the cause of the defects. All that he has talked about is that there is something which causes an interruption in the process of development and leaves indelible traces upon the teeth. He clearly laid it down in his paper that he would not touch upon this subject, and I think most of us will admit that the subject is far from being exhausted; and I will say that for Dr. Zsigmondy and myself, we are oppressed with the difficulties that are before us in this investigation. I think it is important for us to give attention to something which Dr. Zsigmondy has carried farther than any other person, the histological investigation of this subject. He has laid the points before you as a preliminary investigation, and I am perfectly certain that when you get an opportunity of reading and studying his paper you will find it to be full of merit. Furthermore, I would ask those who are interested in the subject to examine his remarkable specimens, which he will show under the microscope at a more convenient

Digitized by Google

opportunity. I would suggest, Mr. President, if it were feasible, that the section more especially charged with the subject might fitly discuss this question and continue it after an inspection of the specimens and having read the paper more thoroughly.

With regard to the question of the presence of enamel defects in the temporary teeth as well as the permanent ones, there can be no doubt, but we have nothing to say as to what the causes are. With regard to the line of interruption which he mentions, it is a new fact brought before us in a very interesting way. So far as the microscopic appearance is concerned, no other defects appear upon the coronal portion of the teeth; yet when you examine the sections through the microscope, you find this line of interruption appearing. It must have been due to the same cause, because it is a much larger defect. Those who are familiar with the development of the cap of dentine will see further that the calcification is not an even and straight line, but it is wavy, and waviness will account for that defect.

In studying this question, you will find the defects may be little or great, and the duration may be short or long. We find a variety of defects. I think we owe a debt of gratitude to Dr. Zsigmondy.

Erosion according to the American means one thing; to the English it means another, and to the French it means still another thing. There is no doubt but that the term which has been suggested, hyperplasia, is in conformance with recent researches in pathology. Furthermore, we have had suggested, in addition, that in talking of enamel defects to distinguish them from hyperplasia, which might be a term also applied to the root or cementum of the teeth, to use the term "coronal hyperplasia," not confining ourselves to the enamel, because it is perfectly evident that these interruptions of development affect the dentine as well as the enamel. In giving it a name we must take the name, if we possibly can, that will apply to the whole structure.

DR. C. C. CARROLL, of Chicago. I have listened

Digitized by Google

to the paper of Dr. Zsigmondy with a great deal of interest, because of the word "congenital" in the title, from which I looked for a discussion as to the cause of the disease to which the paper has been confined, and I expected to find in it the hereditary line defined and the character of the disease indicated. The gentleman from Cambridge, Dr. Cunningham, disclaims any effort to assign the cause of the disease. I placed myself on record last year at Niagara Falls on this subject, in reference to a similar case presented by a gentleman from Buffalo, in which there was erosion or lack of enamel over an entire tooth that was there presented, and it was claimed that that was the result of congenital inheritance.

The further discussion of this paper was referred to the Section on Etiology and Pathology.

Adjourned until Wednesday at 12 M.

Digitized by Google

THIRD DAY, WEDNESDAY, AUGUST 16—NOON SESSION.

The session was opened at 12:10 o'clock.

Dr. A. O. Hunt, Secretary of the Executive Committee, then read the following paper:

CONCERNING VARIOUS METHODS ADVOCATED FOR OBVIATING THE NECESSITY OF EXTRACTING DEVITALIZED TOOTH PULPS.

By W. D. Miller, Ph.D., M.D., D.D.S., Berlin, Germany.

It is a fact universally recognized and recently repeatedly emphasized, that the difficulty attending the extraction of devitalized or necrotic tooth pulps forms a serious hindrance in the way of conservative dentistry. The practice now in vogue among good practitioners, of thoroughly removing the pulp and filling the root canal to the apex, is, with very few exceptions, easily carried out in connection with the incisors and cuspids, and gives such sure results that there is no probability that a better method will ever be found. But when we extend this treatment to the bicuspids and molars, the labor and expense entailed are frequently so great as to put it beyond the reach of the great majority of the human race, while even those who are able and willing to pay any sum which the operator may feel justified in demanding, are by no means exempt from chronic inflammation and abscesses on the roots of bicuspids and molars. It will consequently be a great boon if some means or method could be devised which would render the tiring, expensive and sometimes impossible task of removing the pulp and filling the root-canals of molars unnecessary.

While every dentist has now and then knowingly left

Digitized by Google

remains of the pulp in narrow and tortuous canals, or in canals obstructed by calcific matter, and while a great many dentists in European countries have contented themselves with simply devitalizing the pulp and, without further ado, filling over it with amalgam and *leaving the rest to nature*, the first *systematic* attempt to do away entirely with the necessity of extracting the root portions of the pulp appears to have been made by Witzel, who (*Deutsche Monatsschrift für Zahnheilkunde*, 1874, p. 434) presented the view that an application of arsenious acid carefully made to the inflamed pulp devitalized only the diseased tissue, and that by amputating the coronal portion of the pulp twenty-four hours after the application, the ends of the root-stumps might be treated as healthy, freshly exposed pulps. He accordingly capped the stumps with a paste consisting of carbolic acid and oxide of zinc and at once completed the operation with cement or amalgam. Witzel supposed that the stumps healed up, and speaks of a consecutive calcification formation of dentine, etc. He treated 183 cases in this manner *without a single* failure.

In 1886 (Compendium der pathologischen Anatomie der Pulpakrankheiten des Zahnes) Witzel had changed his views considerably and his methods slightly. We find that the stumps of the pulps, instead of "healing up," "shrink together in the most cases to antiseptic threads" under the action of the cement paste.

We also find sublimate playing an important part in the antiseptic treatment. Up to 1886, in many thousands of cases treated in the manner explained, Witzel had 3 per cent. of failures. Notwithstanding this favorable result, his method does not appear to have been very generally adopted and for years we have heard comparatively little of it.

In 1888, Baume (*Deutsche Monatsschrift für Zahnheilkunde*) presented a method of treating devitalized pulps, by which he believed that he had solved the problem with which we are to-day still battling. In one sense, Baume made an advance upon Witzel's views, and, in another sense, he took

Digitized by Google

a step backward. He recognized the fact that "it is useless to attempt to retain vitality in the pulp after the application of arsenic," and consequently directed his efforts not to saving the stumps of the amputated pulp, but to "pickling" them, *i. e.*, to impregnating them with some substance which would prevent their subsequent decomposition. For this purpose, he recommended alum and borax, but soon discarded the former on account of its irritating effect upon the pericementum. After amputating the coronal portion of the pulp, a crystal of borax was placed upon the stump, over this a pledget of tin and the cavity immediately filled. It was in the choice of borax that Baume's method, in my opinion, must be considered as a backward step compared to Witzel's, since we could hardly expect as permanent results with a weak antiseptic like borax, as with the more powerful ones employed by Witzel.

Nevertheless, Baume reported two hundred cases treated, without a single failure; also, other operators gave equally glowing accounts of their success. These brilliant results were apparently of short duration, since in 1891 Guttman (*Verhandlungen der Deutschen Odontologischen Gesellschaft*, Band II, Heft 4) reports ninety-four cases with seventy failures.

The failures consisted in the subsequent appearance of acute pericementitis with its ordinary sequelæ. "Baume's method" seems, on the whole, to have given less satisfaction than Witzel's, and I think we must have expected this result from our knowledge of the substances used by each.

A modification of the above methods employed by Herbst has been exciting considerable attention in America for some months past. Herbst's method, as described by himself (*Deutsche Monatsschrift für Zahnheilkunde*, August, 1892), consists in devitalizing the pulp with cobalt, boring out the pulp chamber with a sharp, round bur, rinsing out the cavity with warm water and immediately sealing it "hermetically" with tin, rotated in with a large instrument. Such particularly good results have been claimed for this operation that it appears desirable to consider in what respect it differs

Digitized by Google

from the methods presented above. The following points present themselves for consideration:

1st. The substance recommended for devitalizing the pulp, under the name of cobalt, is an arsenical ore, partially oxidized by contact with the air, and therefore containing arsenious acid (Gorup-Besanez). We have at present no reason, theoretical or practical, for supposing that cobalt acts any differently upon the pulp from the purer form of arsenic generally in use. In fact, it is the universal experience of the many who have made use of this material for devitalizing pulps, that it does its work about as effectively, although more slowly, than arsenious acid, though Dr. Weil, of Munich, writes me that he has discarded cobalt, an account of the uncertainty of its action. Consequently when Bödecker and Heitzmann claim for cobalt what Witzel formerly claimed for arsenious acid, viz., that the root pulps retain their life after the application, we are justified in awaiting further evidence.

2d. The suggestion hardly accords with general experience that a cavity can be sealed more hermetically by rotating in tin than by the usual methods of applying cement and covering it with amalgam or gold; and in cavities difficult of access, the chances are that cement will serve the purpose better than tin.

3d. The absence of antiseptic precautions in the Herbst method as practiced by himself is, then, the one thing which distinguishes it from the methods of Witzel and Baume. Bödecker has introduced certain changes, such as washing out the cavity with 1:1000 solution of bichloride of mercury, but in Herbst's account of his operations no mention whatever is made of antiseptics; the instruments used are not said to be sterilized and large numbers of bacteria may be introduced into the cavity on the tinfoil.

The facts gained by experience justify us in looking upon this manner of treating teeth with considerable incredulity. We are all perfectly well aware of the fact that the so-called hermetically sealing a cavity is no guarantee against a future decomposition of the pulp. Pulps which have died under

Digitized by Google

old, perfectly air and water-tight cement or gold fillings, pulps which have been devitalized by a blow or by rapid regulating, may cause no trouble for weeks, months or even years, but in the majority of cases, sometimes very soon, sometimes not till after years, a discolored tooth, an acute inflammation, an abscess or a fistula will tell the history of the case.

The method of devitalizing the pulp and immediately filling over it with amalgam, in particular copper-amalgam, has been so extensively practiced that we are not in doubt as to the result of such proceeding. The great majority of teeth, so treated, may give no trouble for a long time. At the end of five years, however, we may expect to find fifty per cent. of them affected with alveolar abscess and the treatment is justly universally condemned at present. Experience has also taught us that, when we have left but small portions of the pulp in narrow root-canals and hermetically filled the cavity, we may reasonably anticipate trouble sooner or later.

Perhaps the majority of dentists have also made more or less extensive use of the method recommended by Bödecker, when they have left a portion or the whole of the pulp in the buccal roots of upper, or mesial roots of lower molars, and filled directly over them after thoroughly bathing them with carbolic acid or some other antiseptic. It remains to be seen whether we shall obtain better results when we employ the method on principle than we did when we employed it as a matter of necessity.

It is not, however, the object of this paper to discuss the methods of either Herbst or Bödecker. They do not inspire me personally with great confidence, but I should not wish to dissuade any one who may feel so inclined, to make trial of them, though it seems to me that we have nearly all been trying them, *nolens volens*, for many years.

I have for a long time labored under the impression that the solution of the problem was to be sought for in the direction first pointed out by Witzel in 1876, with the exception that our efforts should be directed not to retaining

Digitized by Google

the vitality of the root-stumps, but to preventing their subsequent decomposition by impregnating them with a suitable antiseptic.

I am convinced that the success of the impregnation method depends to a very great extent upon the character of the antiseptic employed, and upon its chemical action upon the pulp apart from its antiseptic action.

The qualities desirable in a substance which is to be employed for the purpose in question appear to me to be the following:

1st. It must be a strong antiseptic.

2d. It must be sufficiently soluble and diffusible to guarantee the impregnation of the whole pulp.

3d. It must must not be so diffusible that it will be completely taken up by the surrounding tissue and finally disappear altogether, as is the case with applications of carbolic acid. It is my impression that there is greater danger in too great solubility than in insolubility.

4th. A coagulating action upon the tissue of the pulp appears to me to be desirable, though it may not be absolutely essential. A pulp which is coagulated into a hard, insoluble body, is less likely to furnish nourishment for bacteria, and less likely to offer irritation to the periapical tissue than one in a soft or semi-liquid condition. I am inclined to think that one cause of the failure of Baume's borax treatment is the fact that the pulp becomes converted into a liquid or semi-liquid soapy mass, with a strong alkaline smell and reaction, which I hardly think can be indifferent to the tissue about the apical foramen.

5th. It is desirable that the substance employed have no irritating action upon the pericementum, either at the time of application or subsequently.

6th. It should not discolor the tooth, although, as the treatment concerns chiefly molars, a slight discoloration need not be considered as a very serious matter.

7th. Solid substances are better adapted to the purpose than liquids.

We shall see that it is about as difficult to find a sub-

Digitized by Google

stance which fulfills all the above-mentioned conditions, as it is to find one that fulfills all the requisites of a perfect filling material.

My investigations relating to this subject were begun in 1888, and the result of over 500 experiments reported in the *Dental Cosmos* for August, 1890. Full details of the methods employed will be found in the article referred to.

I may here state in brief that carious teeth freshly extracted, whose pulps were not already putrid, were opened with a large bur, and the coronal portion of the pulp removed. The antiseptic to be tested was applied to the stumps, covered with a layer of tinfoil (in practice goldfoil is preferable), and the cavity filled with cement. The teeth were then planted in agar agar, and put into the incubator. After a given time, sometimes days, sometimes weeks, the teeth were removed, split open and the pulp taken out and placed upon plates of agar agar already infected, which were then placed in the incubator to await development.

In all cases where the pulps had taken up the antiseptic in appreciable quantity, it would be indicated by a corresponding lack of the development of bacteria in their neighborhood. Experiments were also made on calves' pulps in the tooth, as well as in glass tubes, on dogs' teeth, etc.

Those who care to examine the methods employed more fully, will please consult the article referred to above.

According to the results obtained, I have divided dental antiseptics into three groups:

1st. Those which possess in a high degree the power of imparting antiseptic qualities to root pulps, such as cyanide of mercury, bichloride of mercury, diaphtherin, sulphate of copper, salicylate of mercury, oil of cinnamon, ortho-kresol, carbolic acid, trichlorphenol, chloride of zinc. The last four are, however, decidedly inferior to the others; they penetrate the pulp very rapidly, chloride of zinc surprisingly so, but they are lacking in the necessary powerful antiseptic qualities, and are, furthermore, so diffusible that they, in the course of a few weeks, disappear altogether from the pulp.

Digitized by Google

2d. Those of doubtful value, thymol, salicylic acid, eugenol, camphophenique, hydronaphthol, Alpha and Beta naphthol, acetico-tartrate of aluminium and some essential oils, resorcin, thallin, sulpho-carbolate of zinc, oil of birch, iodide of sodium, nitrate of sodium, etc.

3d. Those nearly or quite worthless: Iodoform, basic anilin coloring matters, borax, boracic acid, dermatol, europhen, chloride of lime, peroxide of hydrogen, sozoiodol salts, iodol, tincture of iodine, spirits of camphor, naphthaline, etc., etc.

The grouping of these substances may be surprising to some; in particular, the designation of the peroxide of hydrogen as being worthless for the purpose under consideration. But it must be borne in mind that the peroxide of hydrogen in a root-canal loses its antiseptic action in a very short time, and, while it may make the portion of the pulp with which it comes in contact, aseptic, it does not make it antiseptic, and besides, its action is confined to the surface.

The attempt to apply these results to practice was first made with the bichloride of mercury, which has been used since 1890 in some 400 or 500 cases.

It was first employed in the form of small tablets, having the composition:

(1)	Sublimate, - - - - -	0.01 gram.
	Boracic acid, - - - -	0.02 grams.
or,		
	Sublimate, - - - - -	0.01 gram.
	Common salt, - - - -	0.02 grams.

The pulp having been completely devitalized, the pulp-chamber was thoroughly opened and cleansed, and a tablet applied and slightly crushed with an amalgam plugger, moistened with water and covered with a layer of tinfoil (I now use goldfoil), and the amalgam or cement filling immediately inserted. In about 30 per cent. of the cases, severe pain occurred on the day following the application, sometimes accompanied by intense soreness and swelling,

Digitized by Google

which, however, subsided completely in a day or two, and in no case resulted in suppuration. I can attribute this effect only to the action of the sublimate upon the pericementum. Carbolic acid, too freely used in the treatment of root-canals, *sometimes* brings about a similar condition.

On account of this disagreeable symptom, these tablets were abandoned and the following substituted:

(2)	Sublimate, - - - - -	0.0075 grams.
	Thymol, - - - - - -	0.0075 "

These are applied in the same manner. The thymol being chiefly designed to prevent the sublimate being so rapidly absorbed, besides giving a greater permanency to the application by reducing its solubility. Very seldom, so far, has pain followed the use of these tablets, while experiments out of the mouth show that they still possess sufficient penetrating power.

Another combination employed is:

(3)	Sublimate, - - - - - -	0.005 grams.
	Thymol, - - - - - - -	0.005 "
	Tannin, - - - - - - -	0.005 "

This combination is somewhat empirical, though the design of the tannin will be apparent to every one. The combination does not penetrate as rapidly as No. 2, and discolors the tooth more.

Cyanide of mercury has also been employed in combination with thymol, in the following form:

(4)	Cyanide of mercury, - - -	0.0075 grams.
	Thymol, - - - - - -	0.0075 "

Also the *salicylate of mercury* in the same form. This I think deserving of a trial. Its sparing solubility justifies the belief that its action will be more permanent than that of sublimate. The salicylate is at present used in the treatment of syphilis, large doses being injected once a week, and serving as a depot from which it is slowly and gradually

Digitized by Google

taken up by the system. The sulphate of copper may be used in pure form, but it naturally causes serious discoloration of the tooth at the neck. It is also, I fear, too soluble to give permanent results in pure form. More recently I have directed my experiments toward the discovery of some substance which possesses the desired qualities without discoloring the tooth. Thus far I have obtained the best results from diaphtherin (oxychinaseptol), an antiseptic recently introduced by Emmerich. (*Münchener medecinische Wochenschrift*, No. 19, 1892). It may be applied in pure form. Among liquid antiseptics, the oil of cinnamon takes the first place, and I have much faith in its power to conserve the dead pulp. Like all the liquids, however, it is difficult to apply, and has, besides, the disagreeable quality of discoloring the tooth yellowish-brown. The combination which I have chiefly employed is that of sublimate and thymol. (I have not had opportunity to sufficiently test the others in practice, though I am now using, by way of experiment, the salicylate, and, to some extent, the cyanide of mercury.) It has been employed at the Dental Institute of the University of Berlin in over 200 cases. Of these, only one failure has come to my knowledge, that of a right, lower molar in which secondary decay had appeared around the filling, two years after the treatment, exposing the application. The tooth was sensitive to percussion, and caused pain in masticating. I placed no reliance, however, upon these data because it is impossible to keep track of cases in a clinic, and some of the teeth may well have been extracted without my knowledge. A colleague of mine, who treated ninety cases between 1889 and 1893, was obliged to extract two teeth after fifteen and eighteen months respectively. One of these teeth he kindly sent me for examination, which revealed a gangrenous pulp, as well as the fact that the pulp chamber had not been opened up at all (the case being difficult of access), so that this case should be deducted from the failures. Traces of the tablet found in the cavity of decay still showed antiseptic properties. Another colleague treated thirty cases with one failure; a third, over

Digitized by Google

one hundred cases with no ill effects except discoloration. I myself have treated but six cases in my private practice, all of which are in perfect order at present. I attach as little importance to these statistics, however, as I do to statistics of this nature in general. Some of the most worthless methods ever introduced to the profession have been ushered in with statistics showing 100 per cent. of success. Not that the authors of them were insincere, but the statistics themselves deceptive. Time is the only test for methods like those under consideration, and we can scarcely expect to arrive at a definite conclusion in less than five or ten years. Nor should we be hasty in the application of methods of this nature. One or two cases every month, at least for the first year or two, is all that a careful dentist ought to risk in private practice. Cases should be chosen which are very difficult to treat, and which are otherwise frequently treated by the forceps, such as distal cavities of second or third molars, buccal cavities of third molars, etc. It is not possible at present to form a reliable estimate as to the value of this method of treating teeth; it may also be that much better materials will be found for the purpose than those suggested above. There are, at least, reasons for believing that by a careful application of this method, many teeth may be saved which otherwise would be sacrificed to the forceps, or, what is much worse, be allowed to crumble away.

DISCUSSION.

DR. FRANK ABBOTT, of New York. I have little to say in reference to the paper just read, taking an entirely different view from the author of the paper and those gentlemen who have been quoted in it. To start with, there is only one condition that ever presents itself in my office where I use, or think of using, any material for devitalizing the pulps of teeth, and that is where it is impossible with any material that I have at hand to stop pain. Under those circumstances I have, in the last fifteen years, used arsenic in teeth, as many, perhaps, as three or four times

Digitized by Google

only. To detail to you my practice and how I avoid using arsenic, and how I keep my patients in a comfortable condition, would be comparatively a long story. Taking up the line of treatment after the devitalization, or in a tooth with a dead pulp, is a question of more importance, apparently, as borne upon by this paper than any other. How shall we treat teeth after the pulps are dead so as to avoid pain; how best avoid everything that shall give trouble to our patients? That is a question that has troubled us for many years. For a number of years I have had a practice that seems—I judge from what has been said in reference to it—to be rather unique. I never depend entirely upon the application of an antiseptic in the buccal roots of molars or the small roots of bicuspids in the upper jaw, but I depend upon a material which I force in and around such pulps, if any portion is left in the canals, which is combined with an antiseptic strong enough to answer the purpose, I virtually mummify it.

I have many pulpless teeth to treat, as of course every one has who is in full practice, and I treat them all in the one general way. That way is to open the tooth as carefully as I possibly can, opening the pulp chamber so that I may cleanse every particle thoroughly, and get directly into all the root canals. Then, with a small syringe, use one in ten thousand solution of bichloride of mercury, (a grain of bichloride of mercury in twenty ounces of water), and syringe out these canals as thoroughly as I can, and with a broach, a small instrument that I can apply back and forth in the canals as far as I am able to go, stir up the contents of the canals, and then wash again and so on, stir up and wash until I am pretty sure everything is clean, so that the substance coming out of the tooth as it strikes the white napkin would show you a white, clean color instead of a stain. I conclude that I have washed it thoroughly clean, and then I fill it with oxychloride of zinc, into which I put one drop of one in two thousand of bichloride. Thus I combine the antiseptic properties of bichloride of mercury with the penetrating and antiseptic properties of

Digitized by Google

chloride of zinc, and the oxide of zinc forming a cement by process of crystallization. This is the material that mummifies or holds the substance that is left in the roots of teeth in a condition to give no trouble, and it may be astonishing to some of you to know that instead of opening the tooth and treating it from day to day for a week or ten days, I open a tooth and fill it at the same sitting always, unless I have periosteal irritation, soreness of the tooth, as I touch it. If that is absent, and the tooth is in comparatively good condition, I fill it at once, filling with gold or any substance I wish and dismiss the patient, after painting the gum with a solution of concentrated tincture of aconite root and tincture of iodine. It is a powerful counterirritant, and does the work of relieving the pressure of blood around the root of the tooth.

This, to me, is the simplest, easiest, most quiet method of getting along with that kind of teeth. Should we leave them open, what do we do? We open the root of a tooth and cleanse it out with antiseptics as thoroughly as we like, and the contents of the canaliculi in the substance of the tooth itself remain. Decomposition takes place and the gases of decomposition are all the time forcing themselves into the pulp canal. They cannot get out through the sides of the root because the cement on the surface will not permit it, consequently all the openings in that direction are closed except what might be taken up in the circulation; and if there is a bit of cotton in the crown of the tooth that gas does not come out through it, the result is the pressure at the end of the root, caused not only mechanically, but by the poisonous effect of the gas produced by this decomposition. We must bear in mind that the result of decomposition is what we have to deal with, and not the decomposing process, not the organisms that produce decomposition, but the material produced by the presence of the organisms.

DR. GEORGE CUNNINGHAM, of Cambridge, England. I would like, if possible, to speak exactly to the question of the paper, which is concerning various methods ad-

Digitized by Google

vocated for obviating the necessity of extracting devitalized tooth pulps. It is now some years ago since, in conjunction with Prof. Miller, I had the opportunity of knowing what he was doing, and employing some of those tablets. There are some tablets which he has not mentioned, the cupric sulphate tablets. I regret that our schools are really not so good experimental laboratories as they might be from a physiological and pathological standpoint, but I would like to say that so far all those cases that I have treated in that way, limited, as Dr. Abbott has said, have been quite successful. At the same time I have no doubt that there must be a certain percentage of failures. I am also acquainted with Dr. Herbst's method of treatment, and as I told him, when he first pointed out the method to me, I did not believe in his system, so-called, of hermetical sealing. He compared it with the way in which they sealed meat in tin cans, and by hermetically sealing the meat you restrained the pulp from going into a state of putrefaction. I disputed his statement with regard to canned meats. Sterilize and then close, and I maintain that he does not do that by his process. I would like to support the assumption of Prof. Miller that we can get just as good hermetical sealing by means of cement as we can by the rotation of tin into the cavity. I would say that I have tried his system of so-called cobalt treatment. It is far from being cobalt. I brought a specimen to England, which Dr. Herbst kindly gave to me, and I sent it down to my consulting colleague, and he wrote back and said he had made a rough analysis of it, and in that bottle there was enough arsenic to kill the whole British nation.

Prof. Miller was good enough to give an introductory lecture in England on Operative Dentistry, and he took up this subject and showed us the effects of retaining the pulps alive by the methods which he has described, and we performed some experiments with the Herbst method by means of cobalt. I have used that in wisdom teeth. They are usually functionless.

It would be of great advantage to poor people if we could

Digitized by Google

find some means by which we could shorten up the treatment, and I trust the practice referred to by Dr. Abbott, filling at one sitting, will become common. If we could find something to save us the time it would be a great improvement, and I think the paper we have had to-day is of very great importance, in so far as it points out one way in which we shall be able to bring our operations within the reach of a larger number of the community.

DR. EMIL SCHREIER, of Vienna, Austria. It is indifferent what antiseptic is used. Every antiseptic leads to the same result. It is only necessary to find a material which is easy of application. If any one says he can take an antiseptic material and inject it into the fine tortuous canals, it is a matter impossible for me to comprehend. It is necessary that the material should be one which can be readily introduced into the root canals, and whose effect is prompt and immediate. Such a material Dr. Miller did not mention in his essay. Sodium-potassium is the material which I have presented for this purpose.

Adjourned.

THIRD DAY—WEDNESDAY, AUGUST 16—EVENING SESSION.

The general session was called to order by Vice-President Dr. J. Taft, at 8:15 P. M.

Dr. R. R. Andrews, of Cambridge, Mass., read a paper entitled "A Contribution to the Study of the Development of the Enamel." The paper was illustrated by lantern slides showing enamel development:

Digitized by Google

A CONTRIBUTION TO THE STUDY OF THE DEVELOPMENT OF THE ENAMEL.

By R. R. Andrews, A.M., D.D.S., Cambridge, Mass.

In a paper presented before the dental section of the Tenth International Medical Congress at Berlin in 1890, I gave the result of my investigation on the formation of enamel up to that time. Since then I have devoted much of my leisure to continued study on the same subject. This seems to confirm the position then taken, and, in addition to this, leads me to believe that there exists in the young developing enamel something that has the appearance of fibres, guiding and sustaining the globules that are excreted from the enamel cells which are to form the future enamel rods, upholding and supporting them. An eminent English authority is on record as saying: "The difficulties attendant upon the accurate microscopical investigations of enamel and dentine, especially of the latter tissue, have been so great that very varied views as to their structure and development have been held up to the present time." This would imply that dentine was the more difficult of the two, but my experience teaches me that this is an error. To me the study of enamel development and calcification presents vastly greater difficulties. John and Charles Tomes, father and son, were among the earliest to give careful consideration to the process by which the enamel calcified. They were of the opinion that the enamel was formed by actual conversion of the enamel cell, that the proximal end underwent some chemical change, preparatory to its calcification and subsequently calcified; that the calcification did not go on uniformly throughout the whole thickness, but from its outer surface toward its interior, the centre portion calcifying later than the external. That, as this calcification proceeded, it also united the contiguous cells to each other. Dr. J. L. Williams, in the *Dental Cosmos* for May, 1884, writing on the development of the enamel, says: "On this subject we have yet much to learn." He believes

Digitized by Google

that the enamel organ is glandular in its nature, and a true secreting organ. Appearances teach him that the ameloblasts are the active agents in depositing lime-salts on the periphery of the dentine. In teasing enamel cells from partially formed enamel, he finds that they show a fibre running out from that end of the cell. He tells us that the enamel is probably formed, not by a change of the enamel cells into a glue-yielding basis substance, which afterwards becomes infiltrated with lime-salts, but by a process of secretion and deposition. As the formation of enamel progresses, these cells recede, leaving within the formed enamel what appears to be a fibre of living matter in the center of the enamel prism.

Prof. W. X. Sudduth, in an article in the American System of Dentistry, is of the opinion that during the period of amelification, there is no conversion of living tissue into enamel, but that the enamel is produced by a process of excretion. He finds that at first the salts of calcium are stored up in the meshes of the stellate reticulum of the enamel organ, furnishing material for the first formed layer of enamel. After this the enamel organ, having disappeared from over this calcified layer, the salts of calcium are furnished by a rich plexus of capillary vessels, which are now found to be in direct communication with the enamel cells. He believes that the fibrils, which have been called "Tomes Processes," are nothing more than semi-calcified material which adhere to the enamel cells, giving the appearance of a fibril or prolongation of the cells themselves. He considers them as being mechanically made, for they do not always appear, but depend upon a certain condition of the calcific material. He had succeeded in demonstrating them in the enamel cells of pigs' teeth, where they showed very plainly indeed, being nearly or quite as long as the cells themselves, and several times longer than the enamel was thick. As a rule he finds that the enamel cells separate from the forming enamel so as to leave a comparatively smooth line. He has never been able to demonstrate processes that would lead him to infer the least analogy be-

Digitized by Google

tween them and the fibrils of the odontoblasts. He seems at a loss as to how to regard the cells of the stratum intermedium, and says: "Just what their significance is I am unable to state positively. I am led to believe that they supply the places made by the increase in the circumference of the enamel, and account for the short prisms seen in ground sections of the enamel. Their office is to develop ameloblasts to supply the places of those which are carried up with the growing tooth." To him the enamel is simply a coat of mail supplied by nature to protect that dentine. Kölliker believes that the process of calcification is one of secretion. The "Tomes Processes" he considers as being fragments of the hardened secretion, which are still clinging to the parent cell. Schwann believed that the enamel cell was constantly increasing at the end next the enamel, and that the new growth or younger part is calcified as soon as it is formed. E. Klein says that the enamel is formed by the enamel cells in the same manner as the dentine from the odontoblasts: that is, the distal extremity of the cells next the dentine elongates, and this increment is directly converted into enamel. I wish to repeat what I have already said before, that the continual sheet of tissue that can be raised from young developing enamel is not a membrane, and I think most of the more recent authorities agree with me. Charles Tomes gives us to understand that it is something produced solely by the destructive action of acids; but this I am quite sure will be found to be a mistake. Mr. Mummery has shown that this layer exists in teeth which have not been subjected to the use of acids. It is only that part of the enamel first formed that is not wholly calcified. The enamel cells that have been properly prepared and not shrunken will be seen filled with minute globules, highly refractive, and supplied, when the enamel is first formed, from the meshes of the stellate reticulum, rich in lime-salts at this time. When the stellate reticulum is absorbed, as it is just after calcification commences, the lime is supplied by a rich capillary net-work in contact with the enamel cells. The authorities who speak of granules of lime have de-

Digitized by Google

scribed them as seen in the shrunken cells in the tissue as it is usually prepared. They are really globular, though minute. If, just as calcification commences, we place a few drops of dilute nitric acid on the slide near the edge of the cover-glass, it will, by capillary attraction, run under, and these refractive globular bodies in the stellate recticulum will disappear as will those that are in the enamel cells themselves. Large numbers of small bubbles will accumulate, and force themselves out from under the cover-glass. This would seem a positive demonstration of the presence of the stellate reticulum and enamel cells, of carbonate of lime just previous to commencing calcification. I am convinced that these minute, refractive bodies are calco-spherites, that are taken in by the active enamel cells, and excreted from them where, by coalescing they form larger globules, and these form the rods. You will pardon me here if I quote briefly from my former paper on this subject. In teasing off portions of active enamel cells from enamel forming, I have found the surface of the dentine on which it is being formed covered with layers of globules that have been deposited there by the enamel cells. These given out from the cell continually form, by coalescing larger globules, and these become the enamel rods. One rod is separated from another by what appears to be a protoplasmic substance. This substance in many of my sections projected out beyond the line of calcification, and appeared as though it was a process or a fibre ; of this I shall speak further on. Many of my sections of forming enamel were purposely cut extremely thin, that I might study a single thickness of the layer of the cells, and these specimens were not stained, therefore some of them do not show as clearly in the photo-micrographs as I could wish. Yet I think I shall be able to demonstrate the points of which I speak. Others of these photographs will illustrate it almost as a diagram. Some little time after finishing my former paper on " Enamel; Its Development and Calcification," I read it to Prof. E. L. Mark, of the Biological Department of Harvard University. He stated that I had found and demonstrated new

Digitized by Google

points about the enamel that a German investigator had recently described; that both papers gave similar views. At my request he translated the paper from the German journal in which it was published. Its title was "On the First Processes of the Deposition of the Enamel," by Dr. Graf Spee. The description he gave of this process was so nearly like my own, that I read it with considerable surprise. I did not know that any one had described the enamel rod as being formed by minute globules coming through the cell. But he had seen these minute and highly refractive globules in the body of the cell, and says that when the tissue is properly prepared—and he lays great stress on this point—they are always to be found there at the time of the formation of the enamel. Their entire absence at earlier stages is an indication that these globules are an enamel substance. He gives to them the name "enamel drops," and says he saw these "enamel drops" when enamel is to be formed, appear only in the half of the enamel cells which rests on the dentine; afterwards further up in the cell, but not quite up to the region of its nucleus. Many of them were so small as to be scarcely measurable, and they are always spherical. Great numbers of them are collected at the periphery, and appear here either to be completely merged or to be fused together. The lower part of the cell contains the larger "enamel drops," which merge without sharp boundaries into the substance of the enamel rods. This then appears as a part of the enamel cell, in which the originally isolated "enamel drops" have run together into a continuous mass, and the growth of the enamel rod, once begun, appears to take place by the addition of new "enamel drops." Dr. Spee's "enamel drops" were really what I described as minute calco-spherites which, merging together, had formed larger globules of a substance which I believe to be calco-gobulin.

Perhaps the most important contribution to the literature of dental histology during the last decade is a paper entitled "Some Points in the Structure and Development of Dentine," by J. Howard Mummery, M.R.C.S., L.D.S., of London.

Digitized by Google

This paper was read before the Royal Society, March 5, 1891. Appearances noted and demonstrated by Mr. Mummery in this paper recalled to my mind similar appearances which I had seen in the developing enamel—appearances that I could not then explain, that I did not understand. As some of his results will be of interest to us while considering my subject, I shall try and give a brief idea of them. He noted the appearance of connective tissue fibres, or bundles of fibres, in advance of the main line of calcifica-

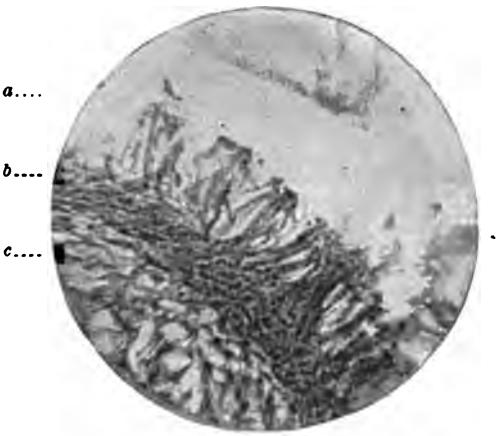


FIG. 1. About 1000 diameters.
a Enamel cells, teased out to show the appearance of fibres.
b Stellate reticulum of enamel organ.

tion, whose high refractive index suggested their partial calcification, these processes being continuous from the formed dentine to the general connective tissue of the pulp. He found in a young developing tooth a distinct reticulum of fine fibres passing between and enveloping the odontoblasts. By a careful focusing, he saw these fibres gathered into bundles and incorporated with the matrix substance of the dentine, out of which they seemed to spring. The origin of these fibres would seem to be from connective tissue cells which are found everywhere in the pulp next the odontoblastic layer, and also, as he demonstrates, between the odontoblasts themselves. He continues: "We can no longer

Digitized by Google

look upon the matrix of dentine as being a homogeneous substance, but must regard it as composed of a net-work of fine fibres of connective tissue, modified by calcification, and, where that process is complete, entirely hidden by densely deposited lime salts." His investigation as to the occurence of this tissue suggests this view; that these fibres are the scaffolding on which the tooth matrix is built up; that they are incorporated in the matrix of the dentine, and form really the basis of its substance. Mr. Mummery's article is convincing and admirably demonstrated. His investigation was

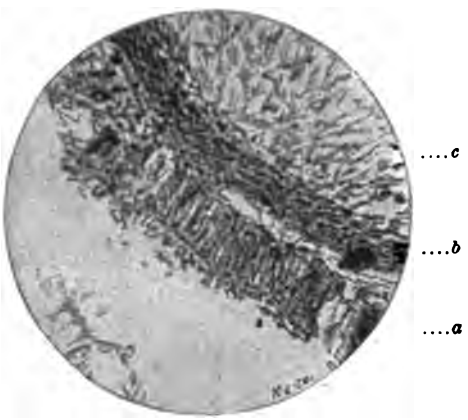


FIG. 2. About 1,000 diameters.

a Enamel cells, teased out to show the appearance of fibres between the enamel cells and the stratum intermedium.
b Stratum intermedium. *c* Stellate reticulum of enamel organ.

carried on after the process of Dr. L. A. Weil, of Munich, which consists of first fixing the soft parts of the developing tooth in a saturated solution of corrosive sublimate in water. When fixed, the sublimate is removed by washing, and the specimen passed through successive strengths of alcohol to absolute alcohol; then into chloroform, to which are gradually added fragments of desiccated Canada balsam, until a very thick solution of the balsam is produced. It is then allowed to penetrate and become hardened by keeping in a warm temperature. After the balsam is hard, the specimen is removed, cut with a fine sharp saw under water, as there

Digitized by Google

has been no decalcification, and the sections thus cut are ground down first on a lathe with corundum, and afterwards on a fine stone with water under the finger. Sections are then mounted in Canada balsam. I have tried this process without any success on the developing enamel. The tissue at this time is too delicate to stand this treatment, and results in my hands have been failures—perhaps from a want of more practice in this method. But I do not believe it can be used with success when the tissues are so delicate.

FIG. 3. About 1000 diameters.

a Layer of enamel cells. *b* The thin layer first forming enamel. *c* Enamel showing fibres. *d* Dentine.

Certainly here the investigation of enamel is more difficult than that of dentine. The method is admirable for investigating fully formed structures, as it shows the organic tissues in undisturbed relation to the calcified tissues. Appearances of calcified fibres projecting beyond the line of calcification, I had already seen in young forming enamel, and I commenced a series of investigations to see if I could find out what these appearances indicated. I commenced by trying to tease apart enamel cells; after some little experimenting

Digitized by Google

I am quite sure I found evidences that processes from the cells of the stratum intermedium of the enamel organ pass down through and among the ameloblasts to the forming enamel beneath. (See Fig. 1.) And I judge that these are the processes which Mr. Tomes saw and described as processes connecting the enamel cells with the cells of the stratum intermedium. I then commenced a series of experiments, trying to separate slightly the layer of enamel cells from the stratum intermedium. The parted edges had the

FIG. 4. About 1000 diameters.

a Forming enamel, showing fibres. *b* Dentine.

appearances of broken processes and in several specimens there are processes crossing from the enamel cells to the stratum intermedium. (See Fig. 2.) I shall try to demonstrate this appearance to you, although I confess I have a difficult task, the teased and pressed tissue and the different depths of the tissue make the matter a difficult one. I think I shall be able to indicate what I mean by my photo-micrographs.

A longitudinal section of a human tooth at birth, just after the process of calcification in the enamel has commenced, will show, between the enamel cells and the formed enamel,

Digitized by Google

a thin layer which has been called by earlier investigators, the membrana preformativa. (Fig. 3, b.) It was misunderstood then; it is not a membrane. It is the latest deposition of enamel from the enamel cells, composed of globules or masses of calco-globulin; and around these globules there seems to be a fibrous net-work. Connecting with this fibrous net-work and running to the formed enamel beneath, we find innumerable thread-like processes, appearing like fibres. (Fig. 3.) In several of my specimens this shows with great

FIG. 5. About 1000 diameters.

a Young layer of enamel. *b* Formed enamel. *c* Dentine.

distinctness. There are indications of fibres which have been broken on the upper portion of this thin layer which appear as though they had been broken off, in the separation of the layer from the enamel cells. (Fig. 4.) In a longitudinal section of the tooth of calf at birth, where the recently formed layer of enamel is still in contact with the fully calcified enamel, I have succeeded in teasing off this younger portion and exposing to view what appear to be fibrils standing out from the surface. (See Fig. 5.) These have apparently been drawn out from the only partially calcified new tissue. ' In another longitudinal section from calf at

Digitized by Google

birth are to be seen, on that part of the enamel broken away from the enamel cells, processes standing out like so many coarse threads. (See Fig. 6.) They appear so large that it is probable they have been enlarged either by the action of reagents, or by calcific matter clinging to a fibre, if one is there; and they are undoubtedly partially calcified. They are very much coarser than the fine fibrils which I saw between the enamel cells. Deeper within, these processes are seen to surround the globules or masses, which have been deposited by the enamel cells, and which are forming the

FIG. 6. About 1000 diameters.

a Enamel forming. Shown as pulled away from the enamel cells.

rods. In another section from tooth of calf, the younger layer of forming enamel shows a net-work of fibres, of which I have already spoken. (See Fig. 7.) They are surrounding the recent deposition of globules. It is only in this layer that I have been able to demonstrate this appearance. I have not been able to see this net-work in more fully formed enamel, but a distinct net-work is always visible in the layer first deposited.

In regard to the processes of the cell, Tomes first describes them, and says they are due to the manner in which the cell calcifies. In his illustrations they are shown as

Digitized by Google

coming from the base of the cell, from the centre and from the extreme edge. Sudduth believes that they have nothing whatever to do with the cell, as being mechanically made. He pictures them as coming from the base of the cell, from both sides of it and from between the cells. Williams, as I have already quoted, states "As the formation of enamel progresses, these (enamel) cells recede, leaving within the formed enamel what appears to be a fibre of living matter." We have here, you see, a variety of opinions from

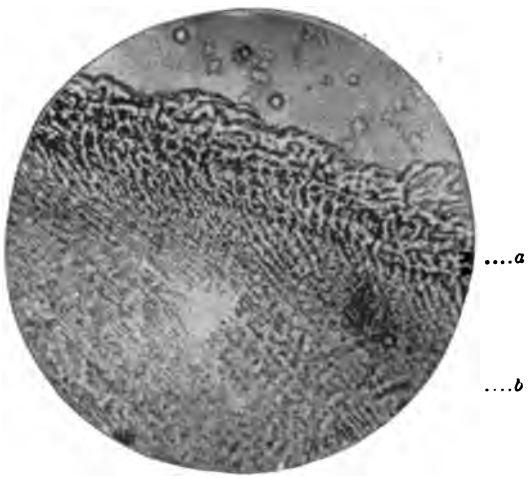


FIG. 7. About 1000 diameters.

a Young layer of enamel showing reticulum. *b* Formed enamel.

excellent observers. My investigation leads me to believe that these processes may have their origin among the cells of the stratum intermedium; that they pass either within or between the enamel cells, and thus on, to form a fibrous sub-structure, among which are deposited the globules which are to form the future enamel rods. When the calcification of the rod is complete, the lime-salts have been so densely deposited as to entirely obscure the appearance of any fibre. The stratum intermedium, in which, as I have stated, I have reason to believe these processes originate, has been thought by more than one observer to be a species of connective

Digitized by Google

tissue. Of this fact I am not certain. But it is certain that, after calcification commences, the connective tissue of the jaw is in direct contact with the cells of the stratum intermedium, and the cells from this stratum must be and are recruited from the connective tissue of the parts. Tomes, who has done much in describing human and comparative dental anatomy, has shown us that fibrils exist in the enamel of the kangaroo and in the sargus, or sheeps-head fish. In this fish the enamel is penetrated by a system of what he describes as tubes, which are not continued out of, or derived from, the dentine, but belong to the enamel itself. They give off numerous branches. This peculiar appearance led Kölliker to believe it was not true enamel, but Tomes proves that, being developed from an enamel organ homologous with and exactly like that of amphibia and reptiles, the tissue must certainly be regarded as unquestionable enamel. To sum up my conclusions, I am led to believe that there probably exists in developing enamel, as has already been found in developing bone and dentine, a fibrous sub-structure on and between which the enamel is deposited. After the enamel is wholly formed, its existence seems to be wholly blotted out in the dense calcification of the tissue. In sections of wholly formed enamel, I have never been able to trace it, although I have tried the methods of those who claim to have seen it. In regard to a beaded protoplasmic reticulum of living matter in formed enamel, I have never been able to find it. I believe with Klein, that it is improbable that nucleated protoplasmic masses are contained in the interstitial substance of the enamel of a fully formed tooth. I wish, in closing, to acknowledge my indebtedness to Prof. George A. Bates, of the Boston Dental College, for the use of specimens of sections of human teeth at the time of birth, which he had prepared, and from which several of my best photo-micrographs have been made.

Thanking you for your kind attention, I will conclude my paper with a demonstration from my photographs.

Digitized by Google

DR. W. Xavier Sudduth, of Minneapolis, Minn., read the following paper:

ON SOME OF THE FORCES THAT INFLUENCE THE FORM OF THE JAWS AND TEETH DURING THE PROCESS OF DEVELOPMENT.

BY W. XAVIER SUDDUTH, A.M., M.D., D.D.S., MINNEAPOLIS, MINN.

In discussing the subject of the evolution of the teeth, it is essential that there shall, at the outset, be a full understanding regarding the relationship of tooth to jaw, as the environment of the tooth has much to do in its formation.

A tooth in its early stages of development is wholly composed of soft tissues, and lies in a bed of embryonal connective tissue, constituting the fœtal jaws.

This easily compressable matrix is bounded on the outer side by the cheeks and lips, which tend to compress it (the jaw), and hold it firmly against the tongue. The shape of the fœtal jaw depends to a very great extent upon the form of the tongue, a pointed tongue giving a pointed arch, while a blunt tongue will give an arch correspondingly shaped. From this it will be seen that even before there is any osseous development, the form of the arch is to a great extent determined by the environment of the jaws.

For a full understanding of the phenomena presented during the evolution of the jaws and teeth, it is necessary to consider the different organs that serve to produce the several parts of the tooth, viz.: the papilla, the enamel organ and the follicular wall. The papilla, or connective-tissue organ, gives rise to the dentine, the enamel organ to the enamel, and the follicular wall to the cement. It also forms the pericementum, which attaches the tooth in its socket or alveolus.

Before the tooth assumes definite form ossification of the maxillæ begins, and each germ is separated into its own alveolus, so that even as early as the third month of gestation the type of the jaws is established. The development

Digitized by Google

of bone in the jaws proceeds in the substance of the soft, connective-tissue matrix in such manner as not to disturb the form of the arch established in the first month of gestation.

The next step in the formative process is seen in the papilla, which now assumes a more or less definite shape, according to the tooth it is to form, conical for incisors and cusped for molars.

The alveolar border gradually rises up around the growing follicle in such a way as almost to envelop it, but not entirely, as the enamel organ is still connected with the oral mucous membrane by its cord. About this time the first layer of dentine is produced as an investing cap for the papilla. It will thus be seen that the papilla determines the form and number of cusps to be possessed by each individual tooth. Upon this thin layer of dentine the enamel is deposited, and by its outward development gives the rounded contour to the crown. These tissues are permanent and not transitory in character; the first formed layers of dentine constitute the extreme apex of the dentine. This now brings the study of the evolution of the teeth up to birth, at which time the process of ossification in the inferior maxilla has reached such a stage that a surrounding bony wall has been formed. If we were now to divest it (the jaw) of its soft tissues, we would find the teeth occupying bony crypts upon its upper surface, much as peas are found in a pod.

The form of the jaw varies in different cases, but has the general shape of a parabolic curve, the outer rim describing a considerably larger arc of a circle than the inner, because of the width of the jaw. On either side of the median line in each maxilla are located the crowns of five deciduous teeth. As these were first prefigured in soft tissues, and shaped in the matrix of the jaws, they will be found to be slightly flattened on the inside of the arch, because of the greater resistance offered by the tongue, while the outer side will be considerably contoured. This is in accordance with the well-known nature of protoplasm, which always shows a

Digitized by Google

marked tendency to assume the globular form when possible. The proximal surfaces are flattened by the pressure of adjoining teeth. Their outer surfaces are broader than their inner because of the greater length of the outer circumference of the arch. The incisors of the deciduous set are wedge-shaped, but less markedly so than those of the permanent set, a point to be explained later on. The molars are more or less bluntly cusped.

The next stage in the process of development is eruption and concomitant formation of the roots around which the temporary process forms, closely hugging the roots.

The anterior permanent teeth arise from buds that are given off from the inner side of the enamel organs of the temporary teeth, and from the mucous membrane of the mouth for the molars. The anterior germs occupy crypts on the lingual aspect of the temporary set.

The bicuspids locate immediately beneath the temporary molars. The roots of the deciduous set have much to do with giving form to the crowns of the permanent set, especially the temporary molars, which serve as matrices. The cusps of all molars are the result of compression of the rounded papilla, which becomes depressed at its greatest convexity. The larger the bulb, the greater the opportunity for the formation of sulci and fissures.

A human tooth once fully formed and erupted is subject only to two changes in form. This is by mechanical abrasion and chemical disintegration, and as these are not inherited, they have little interest to us in this connection.

Anything that interferes with the normal process of development will necessarily leave its impress on the crown in the shape of malformations. This is so well known that it need not be discussed in this connection. Suffice it to say that congenital syphilis, rachitis, scrofula, all the exanthemata and pathological processes in general, in connection with the absorption of the roots of the temporary teeth, are among the several factors that pathologically influence the form of the crowns of the teeth. Faulty nutrition, from whatsoever cause, results in poorly calcified and malformed teeth in a great variety of forms.

Digitized by Google

There yet remains to be considered the effect of use and disuse, and the indirect influence of environment.

As we have seen, the teeth are fully formed, so far as their crowns are concerned, before they erupt, consequently they are exempt from the influence of "use" and "disuse" in the formative stage, but as many teeth are "continuous" growers, persistent and special use, by producing a condition of hypernutrition may cause an increased development of their roots. Such teeth develop into tusks and are sometimes devoid of enamel, the cement forming the outer covering. In this class we have the tusks of the elephant, hippopotamus, wild boar and such animals.

Certain changes may and also do occur in the form of the teeth as the result of the action of the law of "variation," whereby additional cusps are formed and other similar changes which are subject to inheritance. These changes, as long as they do not interfere with the normal function of the organs, are not detrimental; within certain bounds variation is beneficial. It is this tendency of nature that makes the development of the species possible, and enables nature through the law of the "survival of the fittest" to perpetuate species under adverse environment.

Then, again, we notice a change in the size of the jaws of man during the process of evolution from a savage to a civilized condition. With civilization comes cooked food and other changes in the mode of living that prevent the full development of the jaws by the process of use which we have shown to be an important factor in the development of the alveolar process. As a result the arch is over-crowded and a greater or less degree of irregularity is found. There is also a more or less marked change in the facial angle by the development of the cerebrum, which takes place with the increased intellectuality and the decrease in the animal nature, which latter characteristic is represented by prominent maxillæ. The above changes come under the head of *natural* laws.

There is yet another condition, that of change in form of the jaws as the result of *artificial* selection in animals under

Digitized by Google

domestication, where the position of the teeth in the jaw, as well as marked change in form and even suppression in the number of teeth, may result.

Several cases of this latter defect have come under my notice, the most marked being the common swine and pug dog. Here the fad is for short faces, and as a result the teeth are crowded in the arch or suppressed in eruption.

Not only does this law apply to the brute creation, but the love of the beautiful, as expressed in the selection of even-featured, hence small-jawed, partners for life among men in the more prosperous classes tends to cross a large-toothed male upon a small-jawed female, with the result of crowding the arch.

The discussion of this subject might be indefinitely continued, but I think that I have said sufficient to awake interest and arouse discussion.

The paper was profusely illustrated by photo-micrographs projected upon the screen by the oxyhydrogen light. At its conclusion Dr. Sudduth called on Dr. M. H. Cryer, of Philadelphia, to open the discussion, but before doing so, he showed several slides demonstrating the influence of selection upon the form of the bones of the head and upon the teeth of the hog. The first of these exhibited the hog which took the highest prize in the first agricultural exhibit ever held in England, in 1768. The snout and teeth of the animal had the general characteristics of the wild boar, though somewhat modified even then by selection in breeding. The second picture was of the hog, of the same breed, which took the prize at the Centennial Exposition in 1876, and showed an entirely different shape of head and snout. The last picture of the series was of the skull of the latter animal from which it was seen that not only was the head modified in shape, but that the last molars had not erupted at all, showing the effect of disuse in shortening the jaws and preventing the normal eruption of these teeth.

Digitized by Google

DISCUSSION.

DR. M. H. CRYER, of Philadelphia. I am a little surprised to be called upon to speak on this subject. I recognize the first slide thrown upon the screen as one of the pictures I am very familiar with. That hog in 1768 won the first prize at the first agricultural show in history; that is, it was the first show that was ever held in England—I think it was at Liverpool, England. There was a picture of the hog taken at that time and put on record, and my brother had it copied for me. About twenty-three or twenty-four years ago I published a little book on the hogs of America, and I had my brother procure this picture. One hundred years after the first show, at the Centennial Exposition in 1876, the hog shown in the second picture on the screen came from the same neighborhood, and was supposed to be in direct line from the hog shown in picture No. 1, and won the first prize, known as the "King of the West." I have the skull of that hog, but I am not sure whether the one shown by Dr. Sudduth is that one or another. I imported some of the descendants of that hog to this country and won prizes all the way from Ohio to this state, and at St. Louis, winning the Herd prize in this state, and the Herd prize in 1872.

In regard to the pug dog, it was one of my fads to breed them for pastime and exhibit them all through the United States. I have found in the best of pug dogs that the teeth were so irregular that the lower ones came on the outside of the upper ones—underhung, as it is called. The teeth of the pug dog are so irregular that the breath becomes offensive, which is one of the objections to this animal. The anterior teeth are soon lost for lack of use through non-occlusion, and the posterior molars often are not erupted, and upon dissection of the jaws are found in a rudimentary condition. All this is the effect of selected breeding, with the efforts directed specially to the shortening of the face.

Adjourned.

Digitized by Google

FOURTH DAY, THURSDAY, AUGUST 17—NOON SESSION.

The session was called to order by President Shepard at 12 M.

Dr. J. M. Whitney, of Honolulu, H. I., then read a paper entitled "Among the Ancient Hawaiians," which was illustrated by diagrams and crania of these people.

AMONG THE ANCIENT HAWAIIANS.

By J. M. Whitney, M.D., D.D.S., Honolulu, H. I.

To the thoughtful and conscientious dental student and practitioner there must certainly arise questions to which he may look in vain for satisfactory answers in his common surroundings. He sees the ravages of dental caries and other diseases so almost universal in our day, and he asks: Is this a necessary evil to which all mankind is subject, or is it a result of the artificial life and varied foods to which our modern civilization binds us? Is dental irregularity due, as some claim, to the mixture of races, and if we could find a people, homogeneous and simple, would these conditions exist? Is it true that, as mankind advances in the stage of being, the third molar is to become gradually eliminated? What is the normal position of adjacent teeth in relation to each other? What relation has the kind of food we use to the building up of dental structure?

We all know the difficulty, amid the complications of modern hygienic conditions, of answering these important questions to our own satisfaction. But if we can examine the dental organs of a simple and isolated people not affected by the vices and diseases, which are surely not a

Digitized by Google

necessary contingent of civilization, but which are sure to follow in its train, we may draw some conclusions which will throw much light on our problems. It would be difficult indeed for most of us to find living subjects in any number meeting these requirements. But fortunately the bony structures are preserved long after the owners of them have passed beyond mortal ken, and if we can obtain the crania, especially, of people who lived upon the earth ages ago, when wants were few and means of supplying them were correspondingly limited, our study of their dental conditions will certainly be interesting and ought to be instructive.

I consider myself especially fortunate in living in a land where both of these requirements are met. First, the native Hawaiian people, until within a hundred years, lived isolated and unknown to the great world, therefore their habits were simple and their wants and opportunities were few. Second, their modes of burial were such that it is possible with comparative ease to obtain some knowledge of their primitive conditions.

"The most isolated place on the globe," that is what Professor Alexander, the learned historian and ethnologist, says of the Hawaiian Islands. Two thousand miles from the Pacific coast of America, equally distant from the Micronesian, Samoan and Tahitian groups, the nearest inhabited islands, and more than twice as far from the east coast of China and Australia, they occupy a unique position on the map of the world.

About the year 500 of the Christian era, a boatload of men and women drifted to those shores either from the Malay archipelago or from one of the southern islands which had previously been settled by Malays. Except a short period of intercouse between the Pacific islands in the eleventh and twelfth centuries, those islands were scarcely known to the world until their discovery by Captain Cook about a hundred years ago. Even the slight intercourse that may have existed during these twelve centuries must have been among kindred races on the Tahitian and Marquesan Islands, so that practically this people (until within

Digitized by Google

a hundred years) had not changed their race, characteristics nor their habits of life during the 1200 years of their existence. Fortunately enough of their history and customs have been preserved to give us a good idea of many of their characteristics, their food, etc. They were of medium height, rarely reaching six feet, with heavy, strong bones, their crania large and thick. Their employments were tilling the soil, fishing and warring. Their games were hurling the spear, riding the surf, board-boxing, wrestling and other exercises requiring great bodily strength and courage.

The climate at the seashore averages 75°, with slight variation from day to day, not varying more than 30° during the year, while, as one ascends the lofty mountains with which the country abounds, any climate may be found to one of perpetual snow. Thus excessive heat is never found and vigor of body can be maintained. In the former days of which we have been speaking such diseases as typhus, typhoid, malarial and scarlet fevers, whooping cough, measles, mumps, small pox, syphilis and leprosy were unknown Disease of the alimentary canal and of the lungs were the most prevalent troubles.

Their animal food consisted mainly of fish, with which the sea abounds. Domestic fowls were common, with dogs and swine, both of which were choice articles of food. Of vegetable foods the principal then as now was the *taro* (*colocasia antiquorum*), which is the Hawaiian "staff of life." From it is made the *poi*, an acid paste, without which a meal is never quite satisfying. They also had yams, sweet potatoes and sugar-cane. Their common fruits were cocoanuts, bananas, bread fruit (when cooked resembling sweet potato) and *ohia* or mountain apple. Their habits of eating were most irregular, often neglecting to supply themselves with food for several days and then gorging themselves at any hour of the day or night.

With the incoming of civilization, of course many of these conditions have changed. Though *poi* and fish are still the favorite articles of food of the native people, they have added to these many acid and sub-acid vegetables and fruits, with meat, fine flour, etc.

Digitized by Google

The second peculiarity of this people, rendering a knowledge of their early physical conditions possible, is their modes of burying their dead. The most ancient and favorite of these places of interment were in the old lava caves with which the island of Hawaii particularly abounds. A lava stream flowing from some opening on the mountain side would cool first on the surface, leaving the still flowing lava within to empty itself on the country below, and thus a long irregular cave of varying dimensions would be formed. Many of these open from mountain sides and often from apparently inaccessible precipices. The ancient Hawaiians were very superstitious; the ghost of the dead was supposed to haunt the body long after death, and the friends of the dead anxiously sought the most remote and inaccessible places for depositing their bodies. The islands were teeming with people, and some of these caves are piled many feet deep with the bones of the ancient dead. No wind nor moisture ever reaches them, and the bones are as perfectly preserved as in our most carefully kept cabinets, after probably hundreds of years since their interment. But the natives even now guard the burying places of their ancestors with most jealous care, and it is not easy even to one familiar with them and their language to obtain access to these ancient sepulchres.

The other mode of burial to which I referred, and which I consider to be much more recent than that of the caves, was in the sand of the seashore. Until within a comparatively few years, specimens of crania and other bones from these burying grounds could be obtained readily in many places. Six or eight miles from Honolulu there was such a place twenty years ago, where for several miles on the seashore these human remains lay bleaching in hundreds under the tropical sun, until they had attained the color and texture of ivory. I have seen several similar places on the island of *Oahu* and on *Kauai* particularly, but they have ceased to exist. In some places the grass has grown completely over the sand mounds, and cattle pasture over whatever bones may remain buried beneath. In others the

Digitized by Google

native people, jealous of their removal, have taken care to break and demolish the skulls, thus rendering them useless. And the South Sea Island laborers have sought everywhere for the skulls and removed the teeth for the purpose of making necklaces of them, of which they are very fond.

Realizing more the value of these ancient remains now that they are so difficult to obtain, I recently spent a week on a journey to the island of Hawaii for the purpose of visiting some of these lava caves, and securing, if possible, some of their treasures. I was fortunate in being able to obtain the assistance of a friend, whose knowledge of the native people and their language made him especially valuable, and I may say indispensable to my success. A voyage of perhaps 200 miles from Honolulu brought us to the vicinity of the caves. Providing ourselves with candles, stout cord, etc., we at once engaged the service of an old native, who claimed to know all about the object of our search, and spent the first day in a vain endeavor to find the ancient cave. Whether the native knew less than he had professed, or whether at the last his courage failed, and he feared the result of guiding us aright, we did not know, but we suspected the latter reason was the true one.

The next day we secured two guides, and after riding many miles over rough, lava-covered land, we reached a spot which our guides pointed to as the entrance to a burial cave. It was near the seashore, far from any human dwelling, and from any place that could support a habitation. We could not believe at first that an opening could exist there large enough to admit a man's body. But with much labor we succeeded in removing the rocks so that by considerable effort we were able to force ourselves through. Leaving our unwilling guides at the entrance, we fastened a cord securely to the opening of the cave, lighted our candles, and proceeded to work our way down. Descending among the rocks until we were at least fifty feet below the surface, we suddenly entered a large room, perhaps forty feet high. There were no bodies here, but opening from this room on several sides there were low, narrow passages. Entering one of

Digitized by Google

these, we followed it for perhaps a quarter of a mile. Part of the way we were obliged to crawl with great difficulty through the narrow tunnel. We were finally rewarded by again suddenly finding ourselves in a large room, and surrounded on every side by the objects of our search. Near the entrance some of the bodies lay as if hastily deposited, but most of them were laid away with care, some upon shelves partly made with sticks laid in the rock at the side of the cave, *more* in an opening at the side, which the remains of a stone wall showed to have been at some time walled off from the rest of the cave, while the dim light of our candles showed us several openings in different directions, which doubtless led to other similar burial caves. The knees were usually drawn up to the breast, tied with a cord, and the whole wrapped in many folds of the native cloth or *tapa*. By the side of each had apparently been left some food, and perhaps his fish-hook or spear, that he might not want for food in his future home. The air being very dry, and perhaps having some antiseptic property, many of the bodies were completely mummified. Deep dust lay upon everything, and the stillness of death was over all. We could easily imagine with what awe the friends of those lying here had crept down at night and laid away their dead, for the greatest secrecy must be observed, so that no one could ever find them. "I do not wish," said a dying chief, "that my bones should be made into arrows to shoot mice with, or into fish-hooks."

We secured as many specimens of *crania* only as we were able to carry, packing them in bags. It was growing dark when we emerged from the cave, and when our natives who were waiting outside saw our bags of bones and realized that they must help us to carry them home, they were in utter consternation. It was with difficulty that they could be persuaded to place them upon their horses, and then, regardless of us, of road or path, they took the shortest way home as fast as their horses could carry them, not daring to look behind lest they should see the pursuing ghosts of their ancestors; leaving us to pick our way as best we could over

Digitized by Google

the rocks in the dark, without even a path, the eight or ten miles to our lodging place.

We have been taught that primitive peoples, living in simple conditions, were in a great measure free from dental caries as we see it in the mouth of our patients, and that many of the forms of dental disease with which we have to contend, were with them wholly unknown. This seems to me a mistaken teaching as far as may be learned from these records. An exceptional opportunity of becoming acquainted with the crania of the ancient people of those islands during the twenty-four years of my residence there, has convinced me that both in the case of those buried in the caves, and of those more recent in the sand, not more than 25% have been free from caries, irregularity or disease. Indeed, I think I have discovered every form of dental disease known to our practice; dental caries in all its many types, necrosis of the teeth, erosion, alveolar abscess, pyorrhœa alveolaris, disease of the antrum of Highmore, necrosis of maxillary, anchylosis of the jaw, salivary calculus, etc. Here was a well developed osseous system; the individual was trained to exercise of the kind that would develop every part of the structure, living upon an abundance of the simplest yet the most nutritious and bone developing of foods that would not cling to the teeth, but would exercise and clean them, with not an element lacking required by our present knowledge, and yet the same dental diseases which we suffer burdened the lives of the ancient Hawaiians.

While this is true, I have been interested to find that the teeth of those who died before civilization had introduced to the people peculiar constitutional diseases, acid fruits and vegetables, fine flour and varied foods, were much less seriously attacked by disease than afterwards. As a general statement the teeth would be found clean, and when caries existed it was here and there in teeth of both maxillæ and on both sides, but not so pervading as found in the more recent crania, or in the mouths especially of the young of the present time.

Digitized by Google

We have often accounted for the irregularity of teeth found so commonly among Americans, by the mixture of races of which our nation is composed. We say that the wide teeth of the large jaw of one race, being crowded into the narrow jaw of another race with which it has mingled would of necessity produce an irregular arch. But here is a people, isolated from all others for at least 1400 years, with no admixture of races; yet irregularity of the teeth of both maxillæ was almost as common as it is among the mixed races of to-day. It would be difficult to give a good reason why a fixed type for the mouth of this people should not have existed a thousand years ago, and that all, with rare exceptions, should have been modeled from it, had nature designed that there should be absolute uniformity in her work.

Among the crania I have examined I have noticed what seemed to be somewhat fixed as a type, that the teeth are set closely together and well rounded, and that the dense part of the enamel, near the cutting edge or grinding surface, strikes its fellow at that point, the whole being held firmly together by the buttressed third molar.

Perhaps next to dental caries, the greatest source of oral disorders among these people was the irregularity of the third molar, often producing in them as serious consequences as with us of the present time, while its failure to erupt was nearly or quite as common as we find it in our daily practice. So that we cannot argue from these remains, at least, that the coming man is to be deprived of this useful organ.

The relation of food and disease to the health of the dental organs is strongly brought out as we study the changes shown in the teeth of those buried in the oldest caves, and so down through the more recent burials in the sand; then of those who were the old people a quarter of a century ago, whose childhood was passed before civilization had touched their life habits, and their grand-children who are now in our schools. These children, as shown by actual examination, have but little better teeth than their white school-fellows. Their fathers and mothers may have better

Digitized by Google

teeth than the children, but it would be an exception if *they* had not been to the government physician and had one or more teeth removed for relief from odontalgia, while the grand-parents, the old men and women whom I found when I first went to the islands, had teeth approximating those found in the old caves, though not as good.

I lay much of this very great change to the many forms of disease that have weakened their constitution, to fine flour that has become a part of their diet, and eaten in the form of crackers or hard bread clings to the teeth, to the many acid fruits, such as tamarinds, guavas, limes, etc., to which they have constant access, and to spending their childhood and youth in the schoolroom instead of wading and swimming in the warm sea, eating raw the fish and shell fish which they have caught, chewing sugar-cane and stripping off with their teeth the fibrous covering of the cocoa-nut.

THE PRESIDENT. I desire to say that the specimens of Dr. Whitney will remain here for examination by the members after the session is closed. Dr. Whitney's paper is open for

DISCUSSION.

DR. C. N. PEIRCE, of Philadelphia. I want to express my obligation to Dr. Whitney for his paper, as well as for the valuable anthropological specimens he has placed on the table. It is rarely that a body of dentists have the opportunity of seeing specimens that are so emphatically of scientific interest as these presented this morning. Dr. Whitney has brought us into close contact with a race of people that for many hundreds of years, if not thousands, have lived by themselves, have intermarried, and have been shut out from the outside world. It is a question how much this degeneration in teeth and the development of brain structure have been due to this recognized isolation.

There are many peculiarities in these crania which are worthy of note. The first to which he has alluded is with

Digitized by Google

reference to the third molar. He has said that about one-third of the skulls upon the table are deficient, and that shows emphatically that the modification in number and structure of the teeth dates far back beyond the history of these people. Anthropologists tell us that two hundred thousand years is not too long to look towards the modification of the dental structures, so far as structure and number are concerned. We have another peculiarity here, a very marked one, which we do not find at the present day, that is, even in this jaw, where we have so much space and weight, we have the third molar entirely deficient. The germ was never developed. Let me draw your attention to the width of the large ramus of the jaw, which marks all the crania on the table. There is not one on the table but what far exceeds, in its weight and width, the modern jaw of civilization. It is a very remarkable characteristic, and some months ago I had the great pleasure of receiving from Dr. Whitney's hands, twenty crania which were presented to the Academy of Natural Sciences of Philadelphia, and each of those bear the same mark of the ancient crania, that is, the dark color. Those of light color are of recent burial in the sand and not from the caves; but those of ancient burial, dating back 500 or 700 years, and perhaps longer, have this heavy jaw and wide ramus, which is far in excess of those found to-day.

Another peculiarity which has not been mentioned in a body of dentists before—and one to which we are indebted to Dr. Harrison Allen, of Philadelphia—is the tendency in ancient skulls, where the tooth has been lost, for a redevelopment of the process to take the place of the lost tooth.

Now, in one of these skulls, and it is the only one I find in this collection, it is very marked. Where the upper bicuspid and cuspid and first molar had been lost, the lower jaw has retained the teeth and the friction in mastication of the lower teeth upon the upper process has developed here a sharp incisive process which is the result of use or friction. We find in the large collection of skulls of the Academy of Natural Sciences a great number where the teeth having been lost for many months, the friction of the opposing jaw upon

Digitized by Google

the processes has caused a secondary development of the process which to an extent has taken the place of the teeth.

In our modern jaws, where the teeth are all extracted by the dentists and plates are introduced making pressure equally over the whole jaw, we have rarely such an appearance as is presented in some of these jaws, the pressure and friction being more uniform. The absorption is more uniform. But if we look over the collection of ancient jaws, such as we have here, where the teeth have been out for a long time in one jaw and retained in the other, we find a tendency to secondary development. Let me state again that the discovery of this belongs to Dr. Allen, of Philadelphia, who was the first one that brought attention scientifically to that fact. The fact that many of these skulls show the presence of all the diseases that are found at the present day is a very interesting one, showing that whether pyorrhœa, abscess, diseased antrum, or decay, they all existed as they exist at the present time. As I said in the beginning, how much this may be due to the fact that these were an isolated people, intermarrying for several hundred or thousand years together, and cut off entirely from the outside world, is a question to be taken into consideration.

The paper was referred to Section VIII for further discussion.

Dr. J. Hayhurst, of Lambertville, New Jersey, from the Committee on the History of Dentistry in the United States, then read an abstract of the history. [The entire history will be published in a separate volume.]

THE PRESIDENT. By special vote the Executive Committee instructed the chair to allow a veteran in dentistry to occupy five minutes of time. He is on the platform, and I now take pleasure in introducing him to you. He is well known to most of you—Dr. Corydon Palmer, of Warren, Ohio.

DR. PALMER. My friends will have to indulge me, as I am not able to speak very loud, but I hope they will be able

Digitized by Google

to hear. As our great prophet, Dr. Atkinson, used to say, the angels will help us, and I am glad to have this opportunity to speak in connection with the report of the history of dentistry which you have just heard. I wish to have it known that I belong to that period when the advance in modern dentistry began. More than fifty years ago, in 1839, tuition could not be had by a young man, except in the large cities, and for a price anywhere from $300 to $1,000, and no young man was allowed to go into an operating room to see an operation at that time. I have devoted my life and love to our profession, towards doing good for humanity, so that my efforts are known to my professional brethren and to the people of our country. If I am worthy of regard, they can best judge.

During a period of fifty years, I have been one of those who have learned things by trying them. I have three ideas I wish to speak of. The *first* one is that we ought to counsel towards the treatment of children's teeth, and I wish to urge you not to practice the premature extraction of the deciduous teeth of children. It is cruel. It produces irregularity and deformity in adult life. *Second*, be careful not to overtax the nervous forces of young persons and girls, especially delicate girls. Do not keep them in the chair too long. I have seen the nervous forces and temperaments of girls destroyed by it. I am one of the pioneers that have gone right along with those who have gone before me, and in the natural course of life I must go one of these days. *Third*, as to the use of arsenic. I began to use it in 1839. Some of you may be familiar with the history of its early use. I made experiments with it, and I thought I could do everything with it. I went through all the different modes of applying it, and I desire to say that the use of cobalt is arsenic in any shape you can fix it. It belongs down below, and if you keep on using it you will have the nightmare which will last until the last breath you breathe and go to eternity with you.

Adjourned.

Digitized by Google

FOURTH DAY, THURSDAY, AUGUST 17—EVENING SESSION.

The session was called to order by President Shepard at 8.10 P. M.

A paper by Mr. D. E. Caush, "Some Changes that take place in and around the Pulp-Canal," was then read.

SOME CHANGES THAT TAKE PLACE IN AND AROUND THE PULP-CANAL.

By D. E. Caush, L.D.S., Eng., Brighton, England.

During the microscopic examinations of exostosed human teeth, my attention was continuously drawn to certain alterations in the shape and structure of the pulp-canals. It was an unusual thing to find in an exostosed tooth a perfect pulp-canal, and this led me to the examination of a large number of these teeth. The subject has been under observation about five years, and the deductions drawn are from the examination of between two and three thousand teeth. We were led to the furtherance of this study on observing certain irregularities of outline in the pulp-canals of the teeth. In some cases we noticed here and there slight excavations at certain points of the canal (see Figs. I and II), and from that stage we were enabled to obtain microscopic slides illustrating the various stages of these changes, until the whole of the

FIG. I. Inferior Molar. Points of enlargement.

Digitized by Google

FIG. II. Superior Molar.
Enlargement going on at time of extraction.

original outline of the pulp-canals had disappeared (Fig. III), leaving in its place a very irregular canal. The canal was also much enlarged (Fig. IV), and it was observed that frequently in different directions (Fig. V), the contour of the canal varied much, as the excavations may extend over a very small portion of the canal, or they may continue in any given direction until a second canal is formed (Fig. VI), frequently passing at right or acute angles to the original canal, continuing until it has passed through the dentine into the cemental tissue (Figs. VII and VIII.) These canals may be either simple or branched, or instead of canals passing thus at angles to the pulp-canal, the two or three canals of an inferior or superior molar may be united together into one large irregular canal.

FIG. III. Superior Molar.
Canal enlarged.

In all cases where this change has taken place the margins of the canals show a more or less irregular edge, produced

Digitized by Google

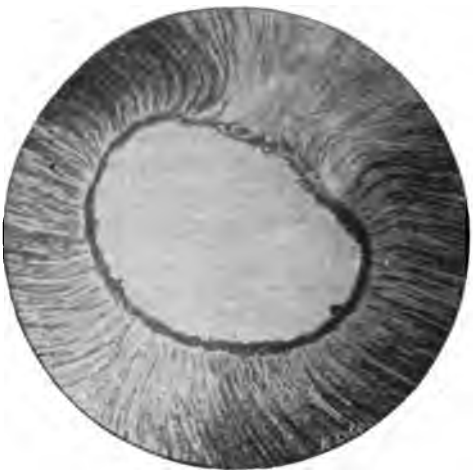


FIG. IV. Superior Molar.
Canal much enlarged.

by the semilunar excavations of the dentine.

The definite termination of the dentine, as seen in the pulp-canal of an ordinary tooth, has given place to the indefinite, and irregular margins are produced.

These semilunar excavations vary much in size, as well as in number, varying from a single light dip or depression, as found in the earlier stage, to the numerous excavations producing the complex and irregular outline as seen in the advanced stage.

If, as is often the case, these teeth remain in position after these excavations have been produced, a second change, more marked even than that of the excavation, oftentimes follows, for in these depressions it is not at all unusual to have a deposition of new bony tissue, entirely different in microscopic structure from the dentine which surrounds it (Figs. IX, X and XI). In this new tissue we have no tubuli

FIG. V. Superior Third Molar.
Series of enlargements. Giant cells in position.

Digitized by Google

FIG. VI. Inferior Bicuspid.
Enlargement of canal, forming secondary canal.

radiating to a given center, as in the ordinary dentine, but in place of the tubuli we have a number of lacunæ and canaliculi, in character somewhat like those found in true cemental tissue. This tissue does not appear to be true bone, as it is very unusual to find any true Haversian system, even where there is comparatively a large amount of the new tissue deposited. The lacunæ as seen in this tissue are irregularly placed, as in the thickened cemental tissue, and vary much in number and position. They may be very closely packed with short canaliculi, or they may be scattered throughout the substance of the tissue, and have canaliculi of some length joining two or more of the lacunæ together.

FIG. VII. Inferior Molar.
Canal passing through dentine.

As to how these changes are brought about is a subject of great interest, and we do well to carefully consider it. The irregular margin (Fig. XII) and semilunar character of the edges give us a clue,

Digitized by Google

FIG. VIII. Inferior Bicuspid.
Canal passing through dentine to cementum.

and show at once that there must have been absorption going on in a greater or lesser degree, according to the amount of change that has taken place. This absorption may have commenced at different points of foci along the margin, and gone on spreading till the whole of the margin is acted upon, or it may commence all along the edge of the canal at the same time. It is evident (microscopically) that such an edge could not be produced by the addition of new tissue alone, as in cases where secondary dentine is deposited either as dentine of repair in those cases where caries have almost penetrated to the pulp-canal, or as a result of repair following accidental penetration of the pulp-canal during the operation of preparing a cavity for filling, or as a result of pulp-calcification, for in either of the enumerated cases the microscopic structure of the tissue is quite different; in all

FIG. IX. Superior Molar.
Several canals, some lined with new tissue.

Digitized by Google

FIG. X. Superior Molar.
Canal enlarged and deposition of new tissue.

these cases the new tissue is always added *directly* to the older tissue without any excavations or absorptions of the original margin (Fig. XIII), and the secondary dentine is deposited directly from the odontoblastic layer of the pulp. It would appear then that these excavations, and this new tissue, cemental in character, could not be produced directly from the odontoblastic layer of the pulp in health, for we have seen under such circumstances, should there be any deposit, it would take the form of secondary dentine or pulp-calcification.

To understand the changes that have taken place in the teeth we must consider three things:

1. The change that takes place in the odontoblastic layer.

2. How the excavation along the margins of the original tissue are produced.

FIG. XI. Superior Third Molar.
New tissue in pulp canal.

3. The manner in which the new tissue is deposited.

It may help us to understand these changes if we devote

Digitized by Google

FIG. XII. Inferior Molar.
Irregular enlargement. Semi-lunar excavations well shown.

a short time to the careful examination of the exterior surface of an exostosed tooth. We will take for our examination a tooth where there has been acute inflammation of the membrane, and then a time of rest. On examining such teeth, the first thing to which our attention will be drawn is the thickened condition of the membrane, and it may appear two or three times as thick as it would appear in health, and at certain places under the membrane we may frequently find excavations going on and giant cells in position; again, in another place in this root we may find some older excavations, and a layer of new tissue filling up the excavations and increasing the size of the exostosed tooth by the additional tissue formed; in fact, the three stages of the development of cemental tissue in exostosis. Keeping these changes before us, we will endeavor to follow up the history of the changes that take place in the pulp-canal.

FIG. XIII. Central Incisor.
Pulp calcification.

Digitized by Google

FIG. XIV. Inferior Bicuspid.
Early stage of enlargement. Thickened membrane.

The first change we have to consider is that which takes place in the layer of odontoblasts, or lining cells of the pulp-canal. These cells are the points of attachment, too, and the source of nourishment from the pulp to the dentine, the connecting link between the hard calcified dentine and the soft vascular tissue and nerve matter that forms the pulp; it is from this layer that the secondary dentine is formed, but under certain circumstances the character of the cells forming this layer changes, both in shape and size. Thus if, by such cause as congestion, or slight inflammation of the pulp, a greater amount of blood is brought to the blood vessels in the pulp, these cells appear to lose their original shape, and (instead of being slightly elongated with processes penetrating into or passing between the tubuli) swell up, the nuclei becoming

FIG. XV. Pulp-Canal.
With thickened membrane. Enlargement going on at the time of extraction.

Digitized by Google

active, and new cells are rapidly formed by cell-division. As these new cells continue to form, a layer like the alveolo-dental membrane in appearance is produced and this newly formed layer presses upon the dentine. The cells in juxtaposition with the dentine begin to absorb the latter, and thus obtain more room for further development. This goes on as long as there is an abnormal blood supply to the pulp, and thus owing to either a long or short time of pressure upon the dentine, caused by the excess of formative material brought to the cells by the increased blood supply, we may have many or few excavations produced, as in the case of chronic inflammation of the pulp we get many excavations, and oftentimes these excavations penetrate more deeply into the original tissue. Or should there be any imperfectly calcified tissue surrounding the pulp-canal, at that point the giant cells will penetrate more easily and the excavations will increase in that direction, and in some cases produce canals that pass out of the pulp-canal at various angles. These excavations may grow continuously, or there may be times of quiescence as well as times of activity, while these terms of activity or rest may correspond with similar changes on the external surface of the tooth and produce layers of cemental tissue. Should the tooth be extracted about this period, nothing but the excavations or the thickened membranes will appear in the pulp-canal. (Figs. XIV and XV.)

These changes, as we have seen, are produced by the changes that have taken place in the odontoblastic layer of the pulp-canal. If the tooth is not extracted, the whole of the pulp becomes more or less congested and altered in character, the odontoblastic layer being destroyed, there is little or no inter-communication with the dentine by the tubuli and at this stage one of two things may occur:

1. The blood supply becomes normal, the congestion temporarily passes away, and for a short time the tooth is tender to the touch, as if there had been periostitis, and from this stage it gradually becomes comfortable, and remains so until the inflammation again commences or;

Digitized by Google

2. The giant-cells change their character, and become formative cells, producing as a result of calcification a fresh tissue in the canal containing a number of lacunæ with their canaliculi. In this tissue thus we have a new tissue formed in the enlarged pulp, in character and in microscopic structure resembling cementum, developed also from a membrane similar in character to the alveolo-dental membrane; and on considering the close relationship during development of the two tissues (dentine and cementum), it does not appear to be at all difficult to follow the various stages that take place in the production of this new tissue. These changes are not confined to the human subject. I have found the various stages in the incisors of the horse, though the molars are all free from any of the various changes. I have also found the incisors of the horse exostosed, as well as the enlargement of the pulp-canal and the new tissue deposited in the excavations.

DISCUSSION.

DR. A. O. HUNT, of Iowa City, Iowa. A question arose in my mind while watching the slides. I have had the idea for some time that all deposition within the body of the pulp would be of a character like cementum rather than dentine, for the reason that the blood supply, after the tooth is formed, comes directly from the peridental membrane. With reference to one of the slides, if you will remember, the author speaks of the canal running out laterally from the pulp-canal, that is, at angles with the pulp-canal, and states that this is accomplished by the excavation produced in the formation of the new cell tissue by pressure upon the dentine. I think, perhaps, he has not seen a condition that often exists in the human teeth, namely, that sometimes there is more than one foramen, more than one pulp-canal even in a tooth that we would say normally ought to have but one; and the appearance of the slides, as thrown upon the screen, indicate to me that that was probably the condition in that one case, where the channel goes out at right angles to the main pulp-canal. Sometimes

Digitized by Google

there are more than one of these, sometimes two or three, or four or five in the same tooth. We usually say it is typical of each root to have but one pulp-canal, but that is not always the rule. I apprehend in this specimen, the formation of deposit, whether it be cemental in character or not, was thrown into the canal and the canal was in a physiological and not a pathological condition.

DR. G. V. BLACK, of Jacksonville, Illinois. I feel like thanking the gentleman for sending us these beautiful slides. The slides in themselves are educational. I like to see these things thrown on the screen, for many of us cannot see them by aid of the microscope, while if they are thrown on the screen, we may all see them. But I have a word to say in regard to the ideas presented in the paper. It has fallen to my lot to cut a great many of these sections, and to study them and to write upon them to some extent. Now there are a number of different calcifications, if I may use that term, occurring in the pulp chamber. We have the secondary dentine in many cases, as one case was shown of secondary dentine filling up the pulp chamber of an inferior tooth, for some distance, perhaps, on account of some abrasion. Then again we may have a true dentinal tumor growing out from the wall of a pulp chamber into the pulp chamber, and presenting the dentinal canaliculi. We find that occasionally, not so often as the other; but the things we find the most of, and the things that were shown mostly upon the screen to-night are calcifications that occur, degeneration undoubtedly, resembling such calcification as we have in the arteries, as we have on the valves of the heart, and other parts of the body. These occur very frequently in the pulp chamber, when from any cause, either from age or disease, or the abrasion of the teeth, calcification of this organ occurs. These may be attached to the pulp chamber, as some of those we have seen upon the screen, or they may be formed within the tissues of the pulp, in various forms. They are not properly tissues. They are simply calcification of tissue in a state of degeneration.

Digitized by Google

As to absorption. Some of those long lines running out through the dentine that we saw upon the screen this evening, I have been in the habit of interpreting as blood vessels. We find these lateral canals running out here and there in different directions from the pulp chamber. They certainly show the things that I have been in the habit of interpreting as infusion of blood vessels from these lateral canals. As to absorptions appearing in the pulp chamber, it is certainly an exceedingly rare thing. We have various forms of the pulp chamber. We have them abnormal, and these fill up with plastic matter, and sometimes they fill up with true tissue appearing in the apex of the root. We may occasionally have them filling up with cementum, but that is rather rare, the true cementum showing tissue characteristic of the cementum in the pulp chamber is a very rare thing, indeed. We find it often in such animals as the elephant and the walrus, but not often in man.

I am reminded there is one point I have left out I should have mentioned. A cavity occurred in the dentine upon one of the slides. It is often the case that we have absorptions penetrating deeply into the dentine from the peridental membrane, and it is easy to cut off a portion of one of those cavities that have been burrowed by absorption from the cementum into the dentinal tissue, and get a cavity such as is shown there, and I should interpret that in that way. These cavities are often filled up with cemental tissue afterwards.

THE PRESIDENT. The next paper is the one by Dr. Cunningham, but as the author is not yet present, it might be well to occupy the time by the discussion of some one of the topics which have been suggested for discussion.

DR. J. Y. CRAWFORD, of Nashville, Tennessee. I think we should have some expression upon one of the subjects: "To what Extent is Interrupted Primary Dentition an Etiological Factor in the Diseases incident thereto, more especially Pulmonary, Digestive and Intestinal Disorders."

Digitized by Google

I desire to bring out some expression upon that subject. I regard the question here propounded and the proper discussion of this question perhaps of as much importance for the dental world as any other one of a scientific character. We are all familiar with the extravagant statements that are made by the medical world, and the practitioners of general medicine in ignoring the influence that this special physiological transaction, as they insist upon calling it, has in the production of the diseases enumerated. Some go so far as to take the position that it has nothing to do with any of the phenomena referred to. I, as a dentist, believe to the contrary, and am willing to admit that unless the theory that is maintained by the dental profession is correct, that perhaps one of the big props upon which we rest as a profession is removed from us. I will refer, for instance, to Dr. Forcheimer's statement in reference to this question. He claims, in a short period of time, to have made clinical examinations of five hundred children undergoing the process of dentition, and announces to the world that there is nothing in it. I want to state that Dr. Forcheimer has not been engaged in professional life long enough to have made that character of clinical investigation of five hundred teething children to entitle him to an intelligent opinion upon the subject, and in view of the scepticism in the medical world upon that question, I hope there will be something said by some of our stronger men upon the scientific side of the subject.

DR. J. TAFT, of Cincinnati, Ohio. I do not believe that difficult dentition is a factor in the production of the diseases mentioned by the last speaker. I do not believe that difficult dentition has much to do with difficulties occurring in the digestive apparatus. It is true there is a concurrence of results in many instances, but I do not believe that difficult dentition makes a general impression, and especially so far as the particular diseases of the digestive tract are concerned, or so far as the lungs are concerned—that is, to any great extent. It is true that these things do oftentimes occur concurrently. As to the precise factor in the arrest or in the retarding of

Digitized by Google

the growth and eruption of teeth, perhaps we are not able fully and clearly to appreciate or understand them. It is true that in a great many instances there is retarded dentition, probably from an arrest of the developing process, from deficient nutrition, or from some condition existing in the individual, either from hereditary or incidental influences, but that simple retarded dentition is the cause of any special disease of the digestive organs or the lungs, or the brain, I do not believe. I do believe that difficult dentition sometimes produces quite an impression, that impressions occur concurrently with this affliction, or with this condition of affairs in the teeth, but it does not seem to me that the difficulty of retarded dentition is a factor in the production of these affections, but that the causes of them must be looked for elsewhere, in defective nutrition, resulting from imperfect food, or imperfectly prepared food, food not adapted to the case, or from some influence outside of the development of the growth of the teeth.

DR. W. J. BARTON, of Paris, Texas. It would seem to me very important not to have this discussion stop at this point, because as dentists we do come in contact with so much irritation of the alimentary canal and of the nervous system that seems to be referable to this particular cause of disturbance, that it would be unfortunate, it seems to me, to leave the matter where Dr. Taft has left it. I wish I had an article here that I read several years ago, taken from the London *Lancet*, referring to a number of children who were treated in one of the English hospitals for children's diseases arising from nervous complications. The irritation of the alimentary canal from retarded dentition probably arises from nervous disturbances, so that such irritation is indirectly, but certainly due to retarded dentition, and this test was made in the children's hospital in London, in which a number of children were treated, and the cases were tabulated and given carefully, and I think very intelligently, having a reference to the idea that the irritation caused by difficult dentition was the cause of those alimentary disturbances and of convulsions

Digitized by Google

and such diseases arising from nervous irritation. In those that were treated by lancing the gums, in a large percentage, relief was obtained that was not obtained in the other cases that were treated through medication and various means. That is about as I remember that article in the London *Lancet*. That made an impression on my mind, and my practice has invariably been to relieve the immediate cause of this irritation manifested in the nervous system, or manifested through the nervous system, in the alimentary canal. There may be other manifestations perhaps, but if you have practiced lancing gums for difficult dentition, you have discovered the relief in so many cases that it would have been criminal in you not to resort to it, because there can be no danger in lancing the gums if lancing is indicated, and even if it should not be very much indicated, there could be no danger to speak of in such cases from lancing, if it is done properly. I believe this is a very important question. I believe the relation in which we stand to the medical fraternity has an important bearing upon this discussion. I believe we ought as dentists to recognize this, and bring physicians into a more technical knowledge of this question, and I am growing in the habit of consulting with physicians and talking this matter over with them.

DR. TAFT. I would ask Dr. Barton to explain the *modus operandi* of difficult dentition. In what does it consist, and what is the occasion of retarded dentition? Let us settle that point first.

DR. BARTON. I find by observation upon this question that it is not the stronger people; it is not the country people, who have out-door exercise, and who are strong and robust; it is not the children among the colored people that have this difficulty, but it is the children among those who are not so strong, whose mothers are not out in the open air much, and who are not strong physically, and in whom nutrition is not good. Now, in this class of patients who come before us, we find that it is the class in whom nutrition is not good. We find that likely the matter

Digitized by Google

of nutrition has a great deal to do with it; but whether it has or whether it has not, we find confronting us directly these cases, and the children being in a reduced condition physically, these cases appear, while under more favorable conditions, in the strong races, and of the strong children of our own race, they would not appear, and so dentition is somewhat abnormal, because the patient is not strong and is not of a robust nature. That may very well be true, and at the same time this phenomenon of retarded dentition is apparent, and the immediate relief is a surgical operation of lancing the gums, whatever the cause may be. I say, in a great many children who are strong, this is not necessary, because nature does the work; but in so many of our cases we find that nature does not do the work. We find that dentition is retarded, and we find that relief can often be given in this way. I believe it is practical; I believe it is not unscientific, and I believe it ought to prevail.

THE PRESIDENT. As Dr. Cunningham has arrived, further discussion upon this topic will be suspended.

A paper was then read, entitled:

LUXATION, OR THE IMMEDIATE METHOD IN THE TREATMENT OF IRREGULAR TEETH.

BY GEORGE CUNNINGHAM, M.A. (Cantab.), D.M.D. (Harv.), L.D.S., ENG.

When an erupting permanent upper incisor has become twisted on its long axis so that its mesial and distal surfaces assume a labiopalatal direction, and its cutting edge is more or less at right angles to the opposing tooth of the lower jaw, it has been the practice of several English practitioners to treat such cases by what is termed "torsion." This operation consists in grasping the tooth near its neck with a suitable pair of forceps, the beaks of which have been guarded with sheet lead or some other substance to prevent

Digitized by Google

injury to the enamel, and then steadily, but forcibly, rotating the tooth within the socket into its normal position.

Though a certain number of teeth so treated have been subsequently lost by putrefaction of the pulp and abscess formation, or by necrosis and absorption (Coleman's Manual of Dental Surgery, 1881, p. 50), there is ample evidence that the operation has been completely successful in a sufficient number of cases to warrant the operator continuing the practice under such circumstances as the patient being unwilling or unable to undergo the slower but more certain method of rotation by mechanical appliances.

It is evident that an important factor in the treatment of such a case must be the particular stage of root formation. The rotation of such a tooth for a young patient where the root is incomplete, and therefore attached to the surrounding tissues by the larger or smaller solid cord of tissue filling up the funnel-shaped root, must differ very materially as to conditions from the rotation of a similar one with the fully completed root, where the central soft tissue connection must be filamentous rather than cord-like. I am not aware of any reliable statistics which indicate that the operation is more practicable in one case than the other, nor what are the reasonable prospects and percentage of successful cases. In my own practice I have, therefore, always adopted slow rotation by mechanical means in such cases.

The fact that immediate rotation has been successful, coupled with the knowledge of the extraordinary repair which takes place in cases of fracture of the jaw even accompanied with complete dislocation of the teeth, induced me to resort to luxation in the treatment of irregularities where ordinary treatment was not applicable. In the course of my papers and discussions on implantation, I have suggested that this artificial production of a fracture of the alveolus is appropriate in certain cases and possesses the advantage of enabling one to move a tooth into a new position without separating it from its attachments to periosteum and the socket.

Digitized by Google

On July 29, 1886, a healthy undergraduate presented himself for treatment of a right upper first molar extensively decayed and affected with acute pulpitis, while inflammation was also becoming acute in the periosteum. The position of the molar was quite close to the first bicuspid, while the second bicuspid was not only rotated on its long axis, but occupied a position completely outside the arch on its palatal aspect. (Fig. I.) It was determined to extract the first molar, an operation which proved of considerable difficulty, owing to the curvature of the roots and the thickness of the alveolus. The second bicuspid occupied such a position that it interfered with the patient's speech and was abso-

FIG. I.

FIG. II.

lutely functionless. The patient was, therefore, induced to regard it for all practical purposes as being already lost, and kindly consented to lend it, as it were, to me for experimental purposes. With a pair of ordinary forceps, of which the beaks were suitably guarded, the bicuspid was first forcibly rotated on its axis, but only with extreme difficulty; and then, on considerable application of force in an outward direction, the alveolus yielded, and the tooth was then drawn into the position recently occupied by the first molar. (Fig. II.)

The occlusion of the tooth with the lower jaw seemed sufficient to retain it in position without the application of either ligatures or splints. An effort was made to keep the wound in as nearly an aseptic condition as possible by freely

Digitized by Google

syringing with mercuric chloride (1 in 1000). Injection of cocaine failed to materially reduce the pain of the operation. On the following day, the bicuspid was found to be extremely loose, and had already altered its position. The crown was disked in order to obviate the change in position. On the second day after the operation, the tooth was much firmer and in a good position. There was very little pain, no swelling, and only slight inflammation. The antiseptic treatment was continued. Four days later the edges of the gum were freely incised in order to promote contraction round the neck of the tooth. On the 18th day of May, in the following year, the patient again presented himself for examination and it was found that the tooth was still loose. Rather more than a year later (June 21, 1888), it was evident that the pulp was no longer alive; and as the tooth was carious, excavation was continued into the pulp chamber and the contents removed. The pulp canals were treated by the immediate method and the carious cavity filled with amalgam. On October 28th, in the same year, the tooth was found to be much firmer, but the cementum was considerably exposed at the neck of the tooth and showed signs of slight superficial caries, though not of such a nature as to warrant operative interference. The patient soon after left Cambridge and I have had no further opportunity of watching the case; but, as the patient informed me in 1892, more than six years after the operation, that all was well, and has faithfully promised to send me my tooth when its sojourn in his mouth is ended, I have every reason to believe that it is still in position.

Another case of a different character is also, I think, instructive. On the 3d of November, 1888, I was consulted by an undergraduate, aged 22, as to the advisability of extracting two upper cuspids occupying a very irregular position within the palate and filling the space by the insertion of an artificial denture. (Fig. III.) After carefully considering the models taken of the case, I advised luxation of the teeth rather than extraction. Before proceeding to operate, however, the teeth were carefully scaled and the

Digitized by Google

inflamed gums brought into a reasonable condition of health. On the 14th of November, the right upper cuspid was luxated into position after the removal of the temporary cuspid which still persisted and completely hid the former from view; the tooth was fixed in its new position by means of thin platinum wire and silk ligatures. On the following day the patient reported that there had not been much after-pain, except from the ligatures on the neighboring teeth. The tooth was already discolored and of a yellowish brown shade. This discoloration was probably due to staining of the dentine from the rupture of the blood vessels of the pulp. On the 3d of December, the left upper cuspid was luxated forcibly into position from the palate and retained

FIG. III.

FIG. IV.

in position by means of platinum wire and silk ligatures. (Fig. IV.) On the following day the patient reported that he had had considerable pain in the evening after the operation, but that he was now quite comfortable. The ligatures were removed nine days later.

On the 12th of December, an effort was made to correct the irregularity in the crowded underhung lower jaw. The left lower lateral incisor was extracted, and an effort made to luxate the left lower cuspid towards the center of the mouth, but in doing so the diagonally placed long tapering twisted rooted cuspid leaped between the beaks of the forceps. It was then determined to replant the tooth in a new position encroaching considerably on the socket of the lateral incisor. At a critical moment in drilling this new alveolus the patient swerved in such a way that the alveolus and

Digitized by Google

gum were perforated at about the level of the frænum of the tongue. It was with considerable difficulty that a new alveolus was formed and the cuspid replanted and ligated with silk. The tooth was merely washed clean without the addition of any antiseptic and without removing the pulp; a mode of treatment I should not now adopt.

In the second case cocaine was not injected from my experience of its general unreliability and its failure to anæsthetize parts so deeply seated as those concerned in this operation.

On the 13th of December the right upper cuspid, to which I have already alluded as being discolored, was found on examination to be non-sensitive to the application of heat. After trephining the pulp it bled freely, but was quite insensitive to the nerve instruments except towards the apex. The discolored dentine was removed as thoroughly as possible, and the anterior wall lined with extremely white colored zinc oxychloride filling, which greatly improved its appearance. The pulp canal was treated and the tooth filled in the usual manner. The left upper cuspid also failed to respond to the heat test, but not the slightest discoloration was then observable, that is, ten days after the operation, whereas discoloration of the right cuspid was observable on the second day.

About August, 1891, nearly three years after, the condition of this case was noted as follows: Right upper cuspid discolored but still firm, left upper cuspid all right in color and firm, lower left cuspid implantation with live pulp a failure, like nearly, if not all, of my attempts to implant teeth with live pulps.

From my own experience in these and other cases, which I have not hitherto published from the fact that a considerable lapse of time is necessary before one can adequately judge of the justifiability of such operations, I have perused with keen interest Dr. Bryan's experiments of a similar nature.*

* The present communication is an extension of one forwarded to the American Dental Society of Europe in 1891, simultaneously with one from Dr. Bryan. Neither paper was read. Dr. Bryan altered his communication, which was read in 1892; mine, by advice of the committee, was not presented and therefore never published.

Digitized by Google

With regard to Dr. Bryan's method, I must confess that I feel dubious about the advisability of lifting the alveolar wall, and I should still prefer to push it out in front of the root without rupturing its normal attachments, even if I found it necessary to facilitate that movement by incising the border of the alveolus on each side of the socket.

Nor can I say that I am prepared to accept his views as to the extent to which the nerves and vessels may be safely stretched.

With regard to Dr. Gysi's compilation of well-known physiological facts, I beg to offer the following remarks: Firstly, it is not at all proved by Dr. Bryan's clinical experiments that the pulp connections may be stretched six millimeters or more, although nerves are not very extensible, but lie somewhat slack. There is nothing analogous in the stretching of the delicate filamentous nerve attachments of a tooth with the well-known surgical operation of stretching a large and important nerve trunk like the inferior dental nerve. In a large nerve trunk the stretching is probably more of the connective tissue than of the actual nerve fibres. The extension of the actual nerve fibres, or what is essential in this connection, the axis cylinder, to any appreciable extent, is scarcely conceivable.

Without disputing in any way his assertion as to the recuperative powers of nerves, arteries and veins, it does not necessarily follow that they fully explain the results of experience. That a tooth may thus be forcibly moved or removed and replaced, and yet retain its natural appearance, is borne out by the recorded experience of several observers. In such cases it is usually assumed that the pulp life has been fully restored, but that has not been completely proved. Dr. Bryan, in his paper, really produces no evidence that the sensibility of the tooth has not been destroyed.

With regard to the advisability or probability of the reunion of the pulp with the tissues outside the tooth, I would call your attention to the following quotation from an excellent paper on the Replantation and Transplantation of Teeth, by Professor Stack of Dublin. (Transactions of the Academy of Medicine in Ireland, 1883.)

Digitized by Google

"It has been repeatedly stated, up till a recent period, that no one has proved to demonstration that a union of the pulp vessels and nerves with their parent trunks could take place through the small apical foramen. At the London meeting of the International Medical Congress, Dr. Joseph Iszlai, of Buda Pesth, stated that there were only two museum specimens known bearing on the subject. These, I believe, were made on the lower animals. Some years ago, however, Dr. Isodor Lyons, in London, found the dentine of a replanted tooth very sensitive, which must, I think, prove that in that case the nerves of the pulp united with their trunks. However, the honor of actually demonstrating this union by observations on replanted and transplanted teeth removed from the human mouth, belongs, I think, to Mr. Arthur Baker, Mr. Abrahams and myself. In a case of great irregularity where two bicuspids had to be removed—that on one side of the mouth growing horizontally in towards the tongue, and that on the opposite side protruding towards the cheek—I was permitted to transpose the teeth, under nitrous oxide. The teeth fitted into their sockets nicely, but after a fortnight the tooth that had been transplanted into the right socket was attacked with alveolar abscess. It had apparently got all right after the operation, but I suppose putrefaction of the pulp had then set in, resulting in the necessity of removing the tooth. The other tooth united firmly, however, and kept a good color. After two months I determined to remove it, but before I did so, I drilled in cautiously through the crown. After each few revolutions I asked if I gave pain, but found I gave none; nor did I give any when the drill entered the surface of the pulp, but at once there was bleeding from the wounded organ. The tooth was then removed and handed to Mr. Abrahams for microscopic examination. In other cases that have come under Mr. Baker's and my notice, where a tooth which had ultimately to be removed for irregularity was replanted for a short time, the microscopic examination has shown evidence of life in the pulp. In all, six teeth have been examined in this way, in four of which were

Digitized by Google

found signs of life, while in two, viz.: one that has already been mentioned, and another, were found bacteria or other evidences of putrefaction."

Stack's cases and the condition of the right upper cuspid described in my second patient seem to indicate that vascular may be re-established but not necessarily the nerve connection.

Fredel's and Scheff's microscopic investigations in this direction seem to prove that this re-establishment of vascular connection is something more than a mere reunion of ruptured vessels, namely: that the pulp atrophies and is replaced by an entirely new ingrowth of vascular pulp tissue into the pulp cavity. At any rate there is sufficient evidence to show that the reunion of the tissues of the pulp is not quite so simple a matter as it would at first sight appear.

After section of any ordinary nerve trunk, complete degeneration of the peripheral end of the nerve ensues while centrally the generation ascends to the next node of Ranvier. If no great distance exists between the cut ends regeneration takes place, not by reunion, but by new fibres growing down the old nerve sheath. Scheff states that he has seen from three to five nerve fibres running into the newly found restitution.

I am not quite able to understand what Dr. Gysi means by his statement that the circulation may be restored by innervation, and certainly I would demur to his statement that the facts he has quoted demonstrate theoretically that the pulp connections may be safely stretched one-fourth of an inch or more when it is found necessary to elongate the tooth in its socket. Nor am I convinced that Dr. Bryan has proved it clinically, although I accept in every way his assertion as to the success of the operation which he describes.

At a recent dental meeting in London, Mr. Gill described the case of a servant who fell down the stairs and fractured the outer plate of the alveolus of the upper jaw so that the teeth were forced out of position and in various degrees of

Digitized by Google

looseness. In forcing the teeth back into their position, some of them were absolutely removed, yet all the teeth, even those which had been removed, presented all the appearance of normal teeth several years after the accident.

Whatever the rationale of the process of repair may be, I should like to support, in the strongest terms possible, my approval of Dr. Bryan's contention as to the advisability of the treatment of certain forms of irregularities under exceptional conditions by surgical means. From the danger and the uncertainty of complications which may possibly arise from injury to the pulp, it is evident that it should not replace the safer treatment by mechanical means. There are, however, cases where mechanical means are out of the question, and thus this new method of treatment may be regarded as filling a niche not previously occupied by any other operative means at our disposal.

Having after a reasonable lapse of time arrived at a conclusion as to the probable success of such treatment, I determined to extend it to several teeth in the next case, to which I would invite your special attention. The patient was a very intelligent undergraduate, aged 20, whose teeth were fairly regular on the right, but quite irregular on the left side; especially the left upper incisor, which was so twisted and projected forwards that both speech and appearance was very materially affected. The left upper first molar was very badly decayed and was extracted, as thereby more than sufficient space could be obtained for the rearrangement of the anterior teeth. The patient having been anæsthetized (nitrous oxide and ether), the molar was extracted, and after fracture of the alveolus between the teeth both bicuspids were luxated backwards by means of Physick's forceps. The cuspid and lateral incisor were similarly treated with the additional help of guarded ordinary forceps. On endeavoring to luxate the central incisor, owing to a curved and distorted root, it slipped down between the beaks of the forceps and thus became completely dislocated from its socket and all its normal

Digitized by Google

FIG. V.

FIG. VI.

FIG. VII.

FIG. VIII.

FIG. IX.

FIG. X.

Digitized by Google

attachments. Although not removed from the bleeding socket, to all intents and purposes it was extracted. Considerable force had to be exerted to thrust it into its new position. The teeth were ligated with thin platinum binding wire and the parts painted with Richardson's styptic colloid.

FIG. XI.

FIG. XII.

The mouth was washed freely with an alcoholic solution of saccharin, etc. (Miller), both before and at least hourly after the operation (7. v. 92, inclusive time of same, one and a quarter hours). Dressings or ligatures, etc., were renewed on the 12, 14, 16 and 20 v. 92 and on the 30th, twenty-three

FIG. XIII.

FIG. XIV.

days after the operation, the ligatures were removed. When last seen, towards the end of July, 1893, the case was completely satisfactory. I had anticipated being obliged at a later date to trephine the central incisor for removal of the pulp, but that has not been necessary as there is not the

Digitized by Google

very slightest trace of discoloration. The illustrations show the palatal aspects of the case before the operation (Figs. V and VIII), five and one-half months (Figs. VI and IX), and fourteen and one-half months after it (Figs. VII and X).

The next case was somewhat similar, except that the teeth were much more decayed, and some modifications in the mode of treatment were adopted. (Figs. XI and XII.) The extraction of the left upper molar and the left lower molar roots was done four days before the operation for luxation, which was performed on the 19th of November, 1892, and without an anæsthetic. The teeth luxated were the two upper bicuspids, cuspid and lateral incisor on the left side, the latter being raised quite half a crown length

FIG. XV.

FIG. XVI.

out of the socket, and thus was practically extracted and replanted. A binding wire splint was applied and the mouth well washed with the saccharin wash and hydrogen peroxide to intensify the action. The patient wrote in his notes of the case that the operation "was not so painful as having the teeth extracted, though of course it took a much longer time." On his return from the Christmas vacation, fifty-six days after the operation, the ligatures were removed. In June last, seven months after, the case was examined and found to be doing well. (Figs. XIII and XIV.)

The next case is merely an illustration of what may be regarded as a preliminary study for a similar operation. (Fig. XV.) I would take this opportunity of showing how

Digitized by Google

valuable is the Davenport split model in demonstrating the functional value of the denture, which after all is surely the cardinal factor underlying all successful regulation. On the left side of the mouth, after the extraction of both the first molars at the age of fifteen years or thereabouts, the arch is regular and the result viewed from the outside seemingly excellent. But the functional value is evidently greatly impaired as shown in this view from the inside. (Fig. XVII.) On the right side, only the superior second bicuspid was extracted, and the result is still worse, as there is so much crowding in and out of the upper teeth that they do not articulate at all with their lower antagonists. (Fig. XVI.) The patient was recommended to me for treatment on the usual methods on the assumption that he would submit in his undergraduate days to the necessarily long and tedious process which he had persistently refused in his school-boy life. I was convinced that he would never submit to the ordinary methods; and, finding the third upper molar would shortly erupt, I proposed to extract that, to divide the alveolus into sections each containing a tooth, and to rearrange them as shown in the next illustration. (Fig. XXIV.) After consultation with my first patient, he consented, but said he must first consult his father *and* his dentist, with the result which I foresaw. The case remains as it was; the teeth are entirely functionless and quite disfiguring.

FIG. XVII.

The next case is typical of a not uncommon irregularity found in adult life. The patient was aged 36 and required bridge work or artificial teeth. The utility of any such appliance or appliances is manifestly and seriously dimin-

Digitized by Google

FIG. XIX.

FIG. XVIII.

FIG. XXI.

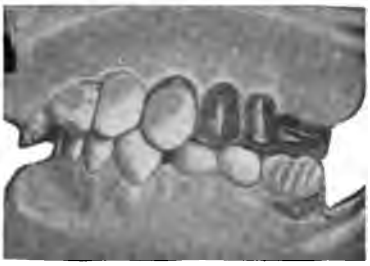


FIG. XXIII.

FIG. XX.

FIG. XXIV.

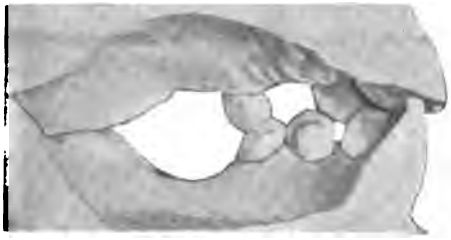


FIG. XXII.

Digitized by Google

ished should some one tooth so interlock that the natural motions of the jaw are materially restrained—in this case the left upper lateral incisor. (Figs. XVIII to XXIII inclusive.) Two incisions with a circular saw revolved in the dental engine were made on each side of the tooth, which was then luxated into position and ligatured as before. No anæsthetic was administered and the whole operation did not last more than a quarter of an hour. Similar treatment followed and the ligatures removed in thirty-five days.

My last case was very similar in every respect, except that the tooth was an upper right first bicuspid biting inside the lower arch. (Figs. XXV to XXVI.) The treatment was similar in every respect except that a splint consisting of a double ferrule of platinum was substituted for the wire ligature. (Fig. XXVII.) The pain of the operation was mitigated by internal administration of sixty drops of sal volatile, and one one-fourth grain cocaine tabloid was allowed to dissolve under the tongue, and a strong solution of cocaine applied to the gum. The patient reported that the operation was less painful than a very difficult extraction of a buried root of the right lower molar on the previous day. The actual operation took ten minutes and the preparation and dressings one-half hour. This splint was much more comfortable than the wire ligatures and was removed on the 22d day. When last seen in June the case was doing well. (Figs. XXVIII and XXIX.)

FIG. XXIX.

Digitized by Google

FIG. XXV.

FIG. XXVI.

FIG. XXVII.

FIG. XXVIII.

Digitized by Google

LUXATION, OR THE IMMEDIATE METHOD IN THE TREATMENT OF IRREGULAR TEETH.—MODUS OPERANDI.

(a) All the teeth should be thoroughly scaled, cavities filled and an alcoholic saccharin wash used several times a day before operation.

(b) On day of operation. Brushing the teeth and bathing them with saccharin wash—better with H_2O_2 than H_2O for dilution—same wash after the operation and frequently next few days.

(c) It is well except in the simplest cases to have studied a model, making the rearrangement of the teeth on a duplicate model. If a splint can be prepared from this ready for use immediately after the operation, so much the better.

(d) All being ready, cut the alveolus with a thin circular saw, $\frac{1}{8}$ inch to $1\frac{1}{4}$ inch in diameter, not thicker than thin note paper, into such sections as are necessary. This is quickly done, and can be borne quite frequently without any anæsthetic. Forceps, elevator or other instrument is used for pushing, pulling or rotating the tooth sections into place. Forceps should have the beaks guarded. I use copper sheaths moulded and soldered so as to fit the beaks fairly tightly. Rubber sheaths, soft or hard, will also do. Dr. Bryan's special forceps with curved support for bringing a tooth inside the arch into line seems well adapted for this purpose. In moving teeth backward or rotating teeth out of line into the arch is much facilitated when a badly carious neighboring tooth must be extracted. This extraction may be done at the time, but possibly better two days or so previously, as the local post-operative inflammation facilitates the bending and movements of the alveolus. In such cases the sectionizing of the tooth and its alveolus may be done with a pair of surgical bone cutters or even with Physick's wisdom teeth forceps. The wedge-shaped beaks of the latter are extremely useful when it is necessary to push the teeth backwards. The movement of the tooth or teeth into the desired position may be very easy, but often re-

Digitized by Google

quires great strength carefully applied. One to six teeth have been so moved. The chief point in the operation is to move each tooth with its socket entire as far as that may be possible.

(e) The teeth when in position should be ligated with silk or thin silvered steel wire, preferably the latter, or fixed in a splint. Thin German silver or platinum bands soldered together make a good splint.

(f) Care must be taken in closing the teeth, as the articulation is almost certain to require adjustment by disking, etc. Carborundum wheels work quickest.

(g) When finished, syringe thoroughly with peroxide, saccharin wash, especially any pockets or spaces marking the previous position of the moved teeth. Paint all the bleeding or cut surfaces with Richardson's styptic colloid. To a saturated solution of tannic acid in alcohol and ether (equal parts) pyroxylin (gun cotton) is added as the liquid will dissolve (tannin collodion preparation). The pain has usually subsided by this time and the patient feels fairly comfortable. The patient should be seen next day in case the teeth have moved—syringing, styptic and cleansing, as before. If possible, continue this treatment for next few days, the patient always using the wash after meals. In a few cases new ligatures may be unnecessary; ligatures should be renewed or dispensed with as required by the indications. A period of three or four weeks is usually ample time for retention by ligatures or splints.

DISCUSSION.

DR. BARTON. I would like to ask Dr. Cunningham if he moves the end of the root in these operations?

DR. CUNNINGHAM. In most instances I hope so. I endeavor to do so. I can only say in some cases I know that separation has taken place between the apex of the root and its ordinary attachments. But the point I endeavor to carry out in my operation is to move the tooth bodily, with its periosteal and osseous investment, expecting such repair as

Digitized by Google

occurs in extraordinary degree in cases of fracture which are perfectly accidental.

DR. CRAWFORD. Is the pulp tissue immediately around the foramen capable of being stretched to any extent without severing it?

DR. CUNNINGHAM. In my opinion, no. Dr. Bryan wrote a paper upon this subject and brought forward certain physiological facts in support of his method of doing the same thing His method differs from mine, because he believes in moving the alveolus, and then moving the tooth out to fit the alveolus. I do not dispute the results he has obtained. Dr. Gysi, I think, compiled a series of what he called well known physiological facts, and that was among them. He explained it by the stretching that occurred. He went so far as to say that he thought the pulp connections may be stretched six millimeters or more. I do not think so.

DR. S. P. JOHNSON, of Grand Forks, North Dakota. I would like to ask if the doctor has any trouble in the occlusion of the teeth, the bicuspids and molars, after they are brought into position?

DR. CUNNINGHAM. Yes, I have found some difficulty. The way in which I obviate it, is by disking the occluding teeth until the articulation is readjusted satisfactorily.

DR. WILLIAM JARVIE, of Brooklyn. I would like to ask Dr. Cunningham how much force is required to move one of these teeth into a new position—as much as would be required to extract that same tooth, or less?

DR. CUNNINGHAM. In some instances a great deal more, but not so much when the alveolus is cut into sections.

DR. JARVIE. There is one matter that occurs to me in connection with this paper. This is an exceedingly interesting subject to me, and I have no doubt it is to any one who is interested in the regulation of teeth. Dr. Cunningham has had some eight years of experience in this sort of work, and I would like to ask him after this experience, whether he would advise this method of regulating teeth in a large number of teeth, or whether he would advise it in only a few cases, and in a majority of cases would advise the

Digitized by Google

ordinary slow method of regulating. He has shown us on the canvas to-night some marvellous results in cases where he has moved a tooth at least the difference of a quarter of an inch, and he tells us that the pulps continue alive, and, barring the pain of the operation at the moment, there are no results at all that are severe to the patient. Now if irregular sets of teeth can be made regular by a method that will involve but a few minutes' pain and operation, it seems to me such a method is infinitely more desirable than one that will extend over a period of several weeks or months, and one whose experience extends over a period of eight years ought to be able to give us some opinion as to the comparative merits of the two systems.

DR. CUNNINGHAM. That question is rather a difficult one. I cannot dispose of it as easily as I could wish. I do not think I have sufficiently brought out the question of pain, which of course would be a very material factor in determining the answer to such a question. In the first case, where I moved so many teeth, I performed the operation under nitrous oxide and ether. In the second case, I performed the entire operation without any anæsthetic, and in fact all the last cases that you have seen were performed without an anæsthetic. That is interesting, because it proves that the operation is not such a terrible one as it seems. With regard to the comparative merits of the slow and the quick methods, I do not consider that I am yet in a position to give a definite opinion. I am very glad that Dr. Jarvie has pointed out to you that there was a considerable lapse between performing the operation and bringing it before any body of the profession. It has been before the profession as individuals, but this is the first time I have dared to come before a professional audience and present the matter. It is only comparatively recently that I have moved so many teeth, and I have had a certain amount of diffidence about bringing forward apparently so simple and easy a way out of a tremendous difficulty, both for patient and operator. But I hold that such a demonstration, if you approve of it, as you have to-night, must be treated with the

Digitized by Google

greatest possible regard, and only applied with extreme care and judgment; and I maintain that I am not in a position to make any decision and say that such an operation replaces the older method. All I claim with this method is that I have succeeded where the ordinary operation and methods have failed, and where cases have passed from the hands of other dentists, without the patients having been treated as I thought they ought to have been, and as I would have, treated them by the slower methods when they were younger. At the same time I do confess there is an element of hope in this operation, which to me is very great, indeed. For instance, in the case of the children of the poorer classes, many cases of great irregularity must at present pass untreated, because of the time and expense necessarily involved in the slow method. Whereas, by the rapid surgical method, many cases might be treated with little more time and little more pain than that involved in the symmetrical extraction of the first permanent molars. You notice the operations have been performed upon the upper jaw. I was talking with a great surgeon upon this subject, and he was surprised that I had not begun with the lower jaw. He claimed the operation would be less difficult on account of the character of the bony tissue; that I would have better circulation and more permanent results. That is only a surgical opinion. I am not prepared to accept it as correct. I will tell you more about it when I have tried it in a lower jaw. Dr. Jarvie, do you think that is an answer to the question? I cannot say more.

DR. JARVIE. To a certain extent it is an answer, and yet it is not. The question of regulating teeth is to me a very interesting one. I am continually doing it, and I take a great deal of interest, and from time to time cases present themselves to me when I wish I could do just what Dr. Cunningham has shown that he has done and done successfully, and I have every time dreaded to attempt it, so I asked him the question publicly, when I might have asked it privately.

DR. CUNNINGHAM. In answer to that I would say that

Digitized by Google

I have never dreaded to perform the operation. Give me a patient and I will perform it to-morrow, and I am prepared to do it at any time, if the patient has arrived at a certain time of life.

DR. JARVIE. You perform it in cases of those who have arrived at adult age, say from twenty years of age, rather than children?

DR. CUNNINGHAM. Yes, sir.

DR. CRAWFORD. I will state somewhat of a hypothetical case. All the teeth he has spoken of, he has moved from within outward, I believe.

DR. CUNNINGHAM. Yes, and from before backward.

DR. CRAWFORD. Suppose you had a bicuspid upon the upper jaw that is entirely on the outside of the lower jaw, and you expected to remove it by this immediate surgical operation, would you prefer cutting through the alveolus, or would you prefer cutting a hole on the inside and moving it into the hole?

DR. CUNNINGHAM. That is a problem which I would have to consider when the case arose. I should have no hesitation in preparing a way for that tooth by removing the bone behind it. I should also slit it as well, so that I would carry with it the alveolus and the periosteum.

The subject was passed.

During the general session, Dr. John J. R. Patrick, of Belleville, Illinois, exhibited an instrument which he had designed for measuring the muscular power of the human jaws and the relative crushing power of the teeth. By reference to the accompanying illustration it will be seen that the jaw (a lever of the third kind), acting on the short arms of the instrument (which is a lever of the first kind), registers the exact crushing power of the jaw and teeth in pounds on the arc which is attached to one of the long arms of the lever; the other long arm acting as an index. Between the two long

Digitized by Google

arms of the instrument are two elliptoid springs, their fixed ends being near the fulcrum on each long arm of the instrument, and their free ends impinging on each other near the arc furnishes the resistance to be overcome by the muscular power of the jaws. The arc serves the double purpose of a

GNATHO-DYNAMOMETER.

graduated scale and a ratchet; the other long arm, the double purpose of a pawl and index.

Adjourned.

Digitized by Google

FIFTH DAY, FRIDAY, AUGUST 18—NOON SESSION.

The session was called to order by President Shepard at 12:05 noon.

Dr. A. O. Hunt, Secretary of the Executive Committee, then read the following paper:

ENGLISH TUBE TEETH; THEIR USE IN PLATE, CROWN AND BRIDGE WORK.

By John Girdwood, L.D.S. (Ed.), D.D.S. (Univ. of Pa.), Edinburg.

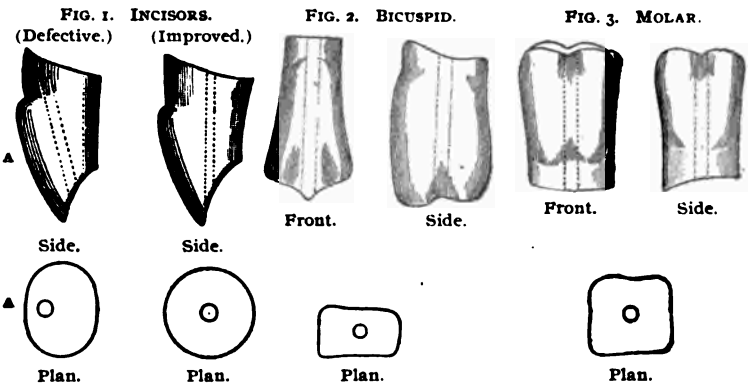
Gentlemen: The absence of a detailed description of the method of using tube teeth from any of the standard American works on operative or mechanical dentistry has long been a subject of surprise to me. It still puzzles many of the leading dentists in Europe, and particularly in England, where tube teeth are still largely used, and found where judiciously employed superior to flat teeth, to know why the system universally practiced here before the introduction of vulcanite should have failed to attract any notice in America. Good as are the results got from flat teeth in most cases, there are yet many instances in which they cannot be utilized successfully, and it is in these that tube teeth are found specially valuable. Before the adoption of vulcanite as a dental base, tube teeth mounted on gold was almost the sole method of supplying artificial teeth. Some of the specimens of work done in those early days compare favorably with what our best mechanics can show now, and, for strength, durability and comfort, cannot be surpassed. It is not uncommon in this country to hear veterans of our profession sigh for the good old days when tube teeth and

Digitized by Google

gold were the prosthetic dentist's sheet anchor. They grumble that, since the introduction of vulcanite, the average mechanic is not so good as he used to be, and when we consider that the working of plate and tubes calls for more mechanical ingenuity and resource than does vulcanite, it seems likely that there may be some truth in what they say.

The present seems a fitting time to bring before you this subject, especially when we know that in crown and bridge-work, specialties indigenous to America, these teeth

DEFECTIVE AND IMPROVED TUBING.



have a new field opened to them. History tends to repeat itself, even in our profession; before now, the perusal of an old journal has left in the brain of the reader an idea which, if old, has been turned to some useful modern purpose. The writer of this essay, therefore, feels justified in bringing under your notice a subject which, if not original *in toto*, is so rapidly falling into disuse, as to be almost beyond the ken of the present generation of dentists, even with us, but which, in spite of that decline, has in many points never been improved on.

The English tube tooth differs from the flat favorite in one essential, viz.: that its attachment to the piece to which it is adjusted is effected by means of a central tube (running through the body of the tooth), and into it a pin or post is introduced. Figs. 1, 2, 3.

Digitized by Google

Before proceeding further, it may here be well to set before you a few of the advantages claimed for tube over flat teeth. By this course their character will be better described than by mere definition.

Firstly. Although adaptable in any situation on both jaws, they are specially superior as masticators. Being somewhat cubical in shape, they are much stronger than their flat rivals. The tube tooth is supported over its whole lower surface and the greatest strain in occlusion falls mostly in a vertical direction, upon the crown and parallel to the line of the central pin; whereas in a flat tooth, the attachment being on one side only, the impact of the bite is more unevenly distributed.

Secondly. They allow of easy removal for repair, it being possible to add a new tooth in from ten to twenty minutes.

Thirdly. As the quantity of solder used in soldering the backings of flat teeth to the plate is of necessity considerable, the danger of warpage from this cause is proportionately great. By the use of tube teeth, this risk is entirely removed —a consideration which alone seems sufficient to commend their application in all cases back of the cuspids, where flat-back masticating teeth would otherwise be used.

Fourthly. They are more adaptable; a very long tooth can be cut down to any length, and, the body being of the same texture throughout, can be ground and polished perfectly.

Fifthly. They can be used for plate, crown and bridge work, and in some cases in combination with vulcanite. From their ease of adaptability, a small stock of these teeth goes a long way—no mean consideration if one, not within easy reach of a dental depot, must keep a stock of teeth. Hence they are cheaper.

Sixthly. Being a more faithful reproduction of the teeth they replace, they feel more comfortable to the tongue and are less bulky.

Seventhly. They are more easily kept clean, because backings, the bugbear to cleanliness in flat teeth, are done away with and better supports substituted, which, being sur-

Digitized by Google

rounded by porcelain, are out of the reach of any impurity. (Figs. 1, 2, 3.)

For crown and bridge-work, they have all the advantages already enumerated, and, in addition, they can be more perfectly and directly fitted to the root than any other form of porcelain crown. Being made of porcelain with only a thin central platinum tube baked in them, they retain, when mounted for wear in the mouth, their translucency and natural appearance, qualities so often destroyed in flat teeth by the gold backing.

There seems to me, however, to be one defect in the tube incisors and cuspids as at present manufactured. In these the base is frequently too small antero-posteriorly and consequently in many cases it is impossible with them to cover the root completely. Moreover, the tube is very often too near the front, thus destroying the axis of the crown with its root. (Fig. 1 A.)

The bicuspids and molars, however, are free from any such fault and are pre-eminently adapted for crown work. Yet with the front teeth as now manufactured good work can be and is done, and it is only reasonable to suppose that if a fresh demand for them were made by the profession, the rivalry among manufacturers would certainly produce improvements, perhaps beyond what at present is thought necessary.

The application of tube teeth requires the use of a special set of simple hand tools, which had best be described here.

Fig. 4. *A counter-sinker*, for clearing away the bur which forms upon the end of the tube when ground, and for slightly enlarging the orifice of the tube at its base. (A suitable counter-sinker may be made from an old excavator handle ground to a three-sided pyramidal point and tempered hard. It should be large enough to obviate any danger of forcing it into the tube and so splitting the tooth).

Fig. 5. *A tube file*, used to remove the débris from the tube after grinding: it *follows* the counter-sinker and is used *before* trying the tooth on the pin.

Digitized by Google

Fig. 6. *A marker:* this is a piece of straight round wire which should fit the tubes easily, but not loosely, and have one end filed almost to a central point.

Fig. 7. A pair of flat pointed pliers with a longitudinal

TOOLS REQUIRED IN TUBE WORK.

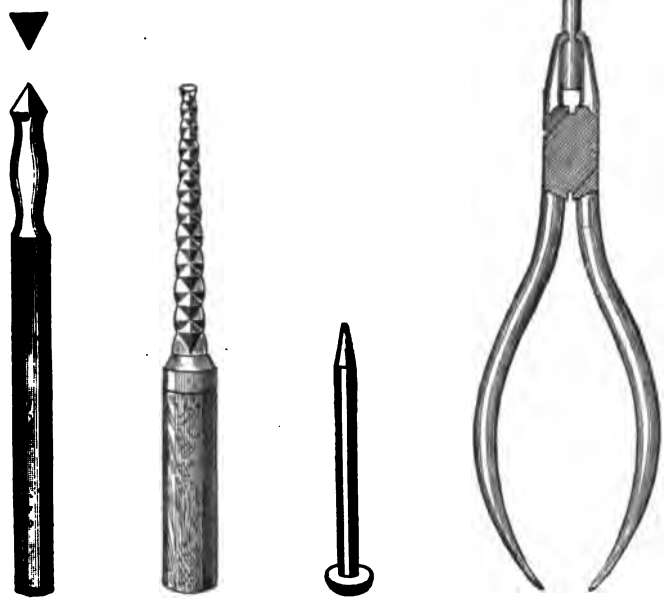


FIG. 4. Countersinker. FIG. 5. Tube file. FIG. 6. Marker. FIG. 7. Roughing pliers, with gold pin ready for insertion.

groove in them for holding the pin while it is inserted in its socket in the plate.

Fig. 8. A sharp pointed graver.

Fig. 9. A length of gold pin wire.

Fig. 10. A pot of paint, made by mixing olive oil and vermilion (it should not be too thin).

Having procured these instruments, their respective uses will be best described in an explanation of the method of mounting the teeth for which they are required.

Digitized by Google

Fig. 11. For this purpose we shall take by way of illustration a partial gold upper, where the lateral incisor and cuspid on the right side and all the grinding teeth on both sides, except the second upper molar right, are absent. Having struck and fitted (Fig. 12) the plate in the ordinary way, and fitted the clasp, a tube tooth is now selected for each side. Care must be taken that the teeth chosen shall be longer than is apparently necessary, so that some tooth

TOOLS REQUIRED IN TUBE WORK.

FIG. 8.
Sharp-pointed graver.

FIG. 9.
Length of pin wire.

FIG. 10.
Pot of vermilion and brush for marking and fine fitting.

substance may be to spare in fitting to the plate and bite. They are now roughly fitted in the positions they will occupy. The counter-sinker removes the bur from the platinum tube at its ground end and the tube file clears out all débris from end to end. Having seen that the tube is clean, replace the teeth on the plate and fasten them in their desired positions with hard wax. (Fig. 13.) Now pass the marking wire *tipped with vermilion paint* down each tube till it touches the plate, where it will leave a mark showing the places at which the holes are to be drilled to receive the pins. Remove the teeth from the plate, taking care not to injure the color mark. This undisturbed, take the sharp pointed

Digitized by Google

graver and make a slight pit for the drill; do not here take the plate from the model, but proceed to drill the holes for the pins, being heedful to keep the drill in every respect at the same angle as was made by the marker with the plate. (Fig. 13.) By means of a broach the holes should be enlarged till they are just a little too small to receive the pin wire full thickness; the rough edge or bur left by the drill must be removed by file and graver and the hole slightly counter-sunk on both sides. A suitable length of gold pin wire should now be cut and the end which is to fit the socket in the plate should be slightly tapered, so as to fit tightly and project a little way through on the palatal surface. A slight groove may with advantage be made longitudinally on the tapered end of the wire, for it assists the solder to run more readily from the palatal to the lingual surface. The tapered end of the pin and the pin hole are then touched with borax and the wire fixed firmly in place by means of the pliers (Fig. 7), attention being paid to its direction. The tooth is next tried on and having ascertained that this particular point is correct, proceed to solder the pins, drawing the solder through from side to side. It is not necessary to invest the plate for this purpose, for the tightness of the pin in its socket will support it sufficiently. In soldering, it is of the utmost importance that the smallest possible quantity of solder be used. It will be at once seen that, as the tube tooth fits the pin exactly, any excess of solder at its

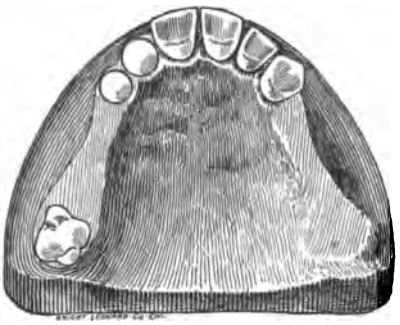


FIG. 11.
Model showing standing teeth.

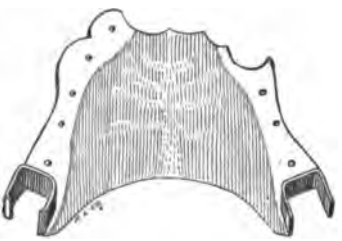


FIG. 12.
Plate and pins for lost teeth.

Digitized by Google

base must prevent the tooth's touching the plate, unless the former be ground out or the superfluous solder cut away—needless labor. When the plate has cooled, the flux is removed by boiling in pickle. From the palatal surface, cut off the projecting end of the pin and smooth it down with curundum wheel and graver till it is level with the plate. Now replace the plate on the model and file down the pins till they accurately fit the bite. That this shortening should be carefully done is of some consequence, because, when the tooth is put in position on its pin, it can be seen at a glance how much of its length there is to go upon in fitting. Place the teeth on the pins and if the latter should have tilted in soldering, it will be at once seen and may be corrected by grasping the pin close to the plate and bending as required. Now comes the fine fitting of the teeth, done best with small wheels. Paint the plate where the tooth will touch it and press the latter gently to place; it does not fit; remove it and a small red mark will show where it is too long; grind off here, and having used countersinker and tube file, try the tooth on its pin again, and continue the process of alternate trying on and grinding till a perfect fit is obtained. It is well in fitting to the plate to remember the bite, for great will be the operator's annoyance, if, after having fitted the tooth beautifully, he finds, on articulating, that it is too short. Now grind the coronal surfaces of the teeth to suit the occlusion of the bite, using

FIG. 13.
Section showing method of marking position of pin posts.

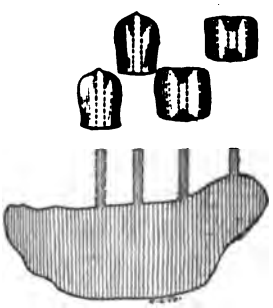


FIG. 14.
Plate and pins, with tube teeth ready for fixing.

Digitized by Google

the vermilion paint freely. Next set the cuspid and first bicuspid on the right side, and these finished, the first bicuspid on each side serving as a guide, the pins for the remaining teeth may be inserted at one soldering.

Fig. 14. Let us presume that all the teeth have been fitted to the plate and to the bite; their ground edges should now be lightly touched against the side of a very fine

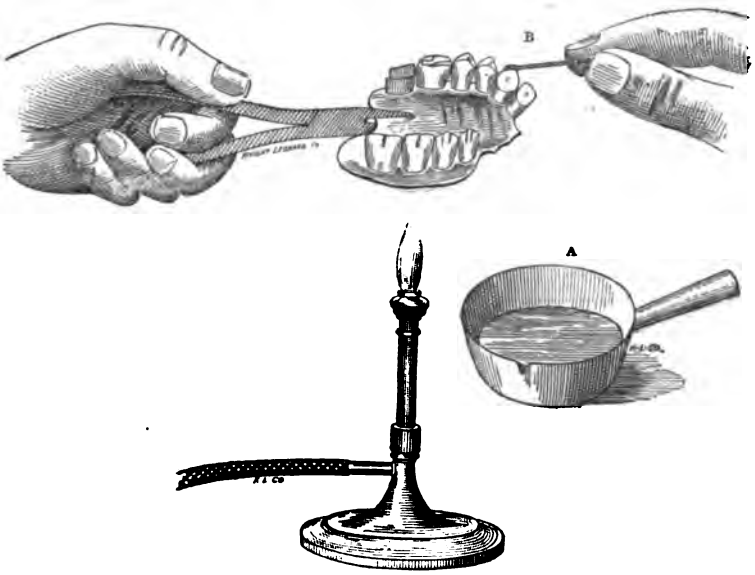


FIG. 15.
Mode of grasping plate in finally fixing teeth.

corundum or other smoothing wheel in the direction opposite to its motion. The teeth are then polished and the coronal ends of the pins are finished to show a rounded end, or ground to the bite according to the requirements of the case. This done, the plate is finished in the usual manner. Previous to fixing the teeth, a few shallow cuts are made in each pin with a fine file. When the teeth have been properly cleaned and freed from all traces of oil (which can be best done by boiling them for a few minutes in a strong solution of soda), their tubes are dried by cotton wound round a broach and their interiors roughened by a clean tube file.

Digitized by Google

Fig. 15 is a good representation of how the teeth are fixed with sulphur. This material is melted till it is quite liquid in the small porcelain Berlin cup marked A, and is kept in this condition and held by an assistant. The operator himself grasps the plate firmly with the pliers (Fig. 7), in the left hand and heats the whole carefully over the lamp. This must be done gradually and the flame ought not to play on the porcelain. In the right hand he takes the wire spatula B (Fig. 15), and, dipping it in the molten sulphur, conveys it to the heated plate and teeth repeatedly, till a surplus begins to show itself. The sulphur runs by capillary attraction under the teeth and along their pins, and when the whole has cooled it sets hard and the teeth are immovable. The excess of sulphur may be removed with a fine pointed knife, and the polishing of the plate makes it ready for the mouth.

This description of the method of fitting tube teeth applies in every particular to every case, be it partial or full, upper or lower. Modifications on it no doubt are made by different men, but, after trying several modes, this recommends itself to me as the most perfect and for the last ten years it has yielded the best results.

Besides the ordinary tube teeth, single gum teeth of this kind are to be had and they prove as satisfactory, when judiciously used, as flat backs. Perhaps it may not be out of place to indicate here the style of cases which will prove most suitable to the use of tubes. The mouth, familiar to every dentist, where all the masticators have been lost and the fronts alone remain standing, could not be better treated than by them. Again, where alternate teeth are missing, the operator cannot do better than replace them with tubes. Vulcanite in such situations is unfavorable, because from the weakness of the rubber tongues, which radiate from the margin of the plate, such dentures can never be permanent. If a gold plate and tubes be applied to such a mouth, the ease with which it can be repaired ought to speak loudly in its favor. By and by the intermediate natural teeth are almost sure to give way and their substitution by tubes added to the old plate is to the mechanic simplicity itself.

Digitized by Google

English Tube Crowns.—In America during recent years attention has occasionally been called to English tube teeth in crown work, although no details of their application have been given. This branch of practice, however, is common enough in England, although the usual method of fitting the tooth to a model, fixing pin and tooth together, and finally cementing them upon the root, is open to many objections; among others, loss of time incurred by taking model and bite, and want of accuracy in fitting.

An improvement on this has, within the last few years, been made by Mr. John Stewart, L. D. S., of Edinburg, my partner, and it has answered so admirably that it is well worth a description. The method is as follows: The root is prepared in the usual manner. If part of it remain above the level of the gum, apply the rubber dam to one tooth on each side before excising, having first anæsthetized the gum by painting on a 20 per cent. solution of cocaine. If possible use a ligature in preference to a clamp for fixing the rubber, because the latter interferes with the bite when the pin comes to be adjusted. Push the rubber up as far as you can, especially on the lingual and labial or buccal aspect for the reason that this kind of crown being bandless, it is well to have its weak point (the union of root and crown) covered by the gum when the dam is taken off. Now drill the canal as you desire with a twist drill a shade larger than the diameter of the wire to be used as a post. If, as often happens in the first bicuspid, the canal be bifid, a piece of wire may be bent, as in Fig. 17, to fit into each canal, and to it the straight post should be soldered. Or the straight pin may be "kneed," as in Fig. 18, and an additional "leg" soldered to it. Both ways are good, provided the soldering is done securely. The post may be made of gold, platinum or English dental alloy; the last I prefer. The post, where possible, should have a

FIG. 16. Single root pin, with post for tube crown.

FIG. 17. Bifid root pins, with posts for tube crowns.

FIG. 18.

Digitized by Google

fine shallow thread cut on it, except where it emerges from the root to enter the crown. This part is the weakest, and its strength should not be impaired even by a screw thread.

Having selected a suitable tooth before applying the rubber fit it roughly to the root. On ascertaining that it fits fairly well, place the pin in the root and try on the crown; if it be much out of line with the other teeth, this fault must be put right, either by bending the pin at the junction of root and crown, or by reaming the canal in the direction necessary, or by a combination of both operations. Now try on the tooth and the pin once more; if everything is right, groove the walls of the canal with a wheel bur, mix the cement and, placing a little in the canal and round the pin, force the latter to place with the pliers (Fig. 7). While the cement is yet soft, take the crown and slightly oil its base; slip it on to the pin and before the cement sets ensure its right position—at this stage a very easy matter. It had best be held in place till the cement has set. Now, having taken off the crown, trim away the surplus cement from the face of the root. The face of the root may be cut out round the post and filled with gold or amalgam, if thought desirable. This, however, I think unnecessary, except in cases where the root has been much hollowed out by decay. The bite now claims attention. Make the patient close his teeth and grind the post till it is clear—(the rubber hardly interferes with this when no clamp is used). Now fit down the tooth on the root as you would to a plate, but instead of using vermilion paint for fine fitting, take a small disc of thinnest articulating paper in the centre of which a hole must be made with the rubber-dam punch, and slip it over the pin on to the face of the root. Then press the tooth to place and grind off where it is marked till a perfect fit is obtained. Next grind to fit the bite, examine the cervical margin and if the crown overlap the root, remove the excess of porcelain till the sides of root and crown are continuous, and polish. Previous to setting, hollow out the base of the crown avoiding the edges; this provides for the presence of a body of cement between the root and the crown, as in the

Digitized by Google

Logan and other crowns. Clean out the tube thoroughly and roughen its interior as in plate-work and fix it with cement, pressing it firmly to place with a Bonwill Crown Setter. The head of the pin may be riveted with an engine-burnisher, but do not omit to examine the bite before the patient leaves.

The shaping of the root is a matter of choice. The two which I have found best are the "Saddle" (Fig. 19) and the well-known "New Richmond" (Fig. 20) shapes. The crown to suit the latter is best fine fitted by hand, with a three-sided corundum file.

Some men have suggested that posts and pins be made of square, oval and other forms of wire, except the round one, in order, as they say, to prevent rotation. Now this at first looks like an improvement, but on examination it proves a fallacy. If the roots have been prepared in any way *except flatly*, rotation cannot possibly take place unless the crown first becomes loose, a misfortune which in practice I find never occurs. Besides being unnecessary, square or oval pins are a positive drawback, and they greatly limit the usefulness of these crowns. They demand in the first place, an unnecessary enlarging of the canal and consequently a root weakened accordingly, while those shapes are less strong as posts than the round. Again, it is sometimes found that after the pin has been set, the direction of the crown is not all that could be desired—that either the mesial or distal corner stands a little out of line. Where a square or oval post has been used, this cannot be corrected, except by the removal and re-adjustment of the post, whereas, when it is round, the crown can be turned on its own axis in any direction wished, and at any stage of the fitting. Thus round posts are superior to all so-called improvements.

ROOT PREPARATIONS.

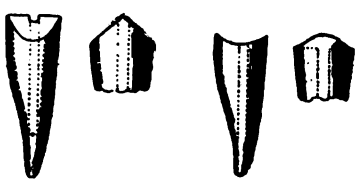


FIG. 19. New Richmond.

FIG. 20. Ordinary saddle shaped.

Digitized by Google

Tube Crowns on Metallic Caps.—If, for any reason, it is considered advantageous to protect the surface of the root by means of a metallic cap and band, the rubber-dam must be dispensed with. Trim the root, making the sides parallel, and after fitting a collar to it, leaving the gold a trifle high, prepare the canal and insert a post loosely. Next take a plaster impression and bite of the whole, and the pin and band will either come away with it, or should they not do so they can be easily replaced. Cast and open; fit a coin gold cap No. 30 thickness, and having soldered it to the band, through it drill or punch a hole for the pin; next place it on the model, insert the pin and correct, when needed, its direction, by bending before soldering to the cap (the pin will be easily bent if nicked with a file, and as this weakness is repaired by the soldering, it in no way imperils the soundness of the post). Having boiled in pickle, replace the united pin, cap and band on the model and proceed to fit the crown as shown. This done, cement it to cap and pin before inserting them in the mouth. This makes a strong and beautiful crown, and while it is applicable *a priori* to single rooted teeth, it may be employed on some molars.

FIG. 21.
Elevation showing blackened bicuspid.

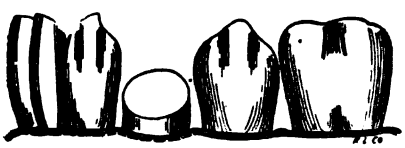


FIG. 22.
Prepared stump.

Tube Crowns on Living Teeth.—It is seldom that tube teeth can be used for this purpose, but two cases have lately been treated by me with great success. Fig. 21 is the first of these, and represents a lower left first bicuspid, which had a large amalgam filling, extending to the crown, on each of its proximal surfaces. The tooth was much discolored, and by its presence the look of a good set of teeth was spoiled. The patient objected to having the

Digitized by Google

pulp drilled into and killed, the more when, on removing the discolored crown calcification of the pulp was discovered. The bite was close, yet the teeth showed a good deal. An all-gold crown would have been too conspicuous; a porcelain-faced one, worthlessly weak and disagreeably conspicuous. After a little thought, it was decided to grind down the buccal aspect of the root nearly to (Fig. 22) the gum margin, leaving the lingual side considerably higher. (Fig. 23.) A cap and band were made to fit the root tightly and pass a short distance under the gum; a pin was soldered to this and a tube tooth adjusted to it and the bite and the whole cemented (Fig. 24) on the living root. This device has been worn for *two* years and bids fair to last *twenty*. The buccal side of the 22 carat gold band is almost covered by the gum, and what of it is seen looks like a tiny cervical filling. The second case thus treated does not differ essentially from this one, except that the bite is somewhat closer, and the crown, if anything, more severely tested.

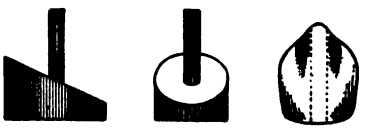


FIG. 23. Prepared bicuspid.
Elevation showing cap and pin inserted.

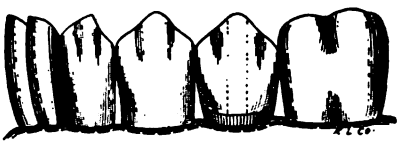


FIG. 24.
Elevation showing bicuspid tooth.

English Tube Teeth in Bridge-work.—The employment of tube teeth in bridge-work is all that now remains to be handled. Its discussion will be facilitated if considered, first, as applied to removable bridges, and then to fixed ones.

All the points of special worth given at the beginning of this paper are emphasized when tube teeth are used in bridge-work. As is well known, one of the great obstacles to making a denture of this kind a success, is the difficulty met with in hiding the gold when the patient laughs. This fault has spoiled many a well-made bridge, and very often has been so glaring as to render recourse to a plate imperative. It will

Digitized by Google

be comforting for those to whom this has long been (as it has to me) a *bête noir* to know that by the use of English tube teeth such a thing can hardly occur. But enough of generalizing; details are, after all, more valuable.

Yet one cannot help repeating that the fact that they show no gold when the patient speaks, ought in itself to commend them particularly for removable plate bridges and for fixed bridges which restore posterior teeth. For fixed bridges replacing the front teeth, they are less suitable, because of the difficulty found in securing proper self-cleansing spaces—the *sine qua non* of the perfect bridge.

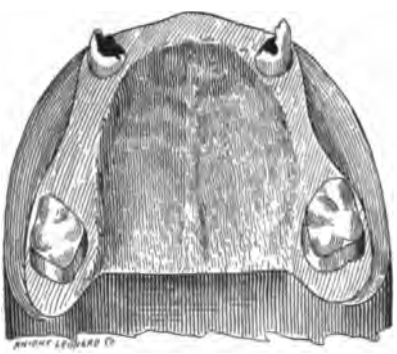


FIG. 25.

Model for removable bridge.

The case shown in Fig. 25, where the cuspids are past filling, and the molars still stand, will serve to explain the manner of constructing a large removable plate bridge with tube teeth. The crowns of the cuspids are to be cut level with the gum and the roots prepared after the usual fashion, the canals being drilled to receive a gold or platinum tube which should be as long as possible, and sufficiently wide to accommodate a No. 13 post of hard gold. The molars are next trimmed to receive gold crowns and a considerable notch is cut in the crown and anterior proximal surface of each. This notch (the object of which will be presently explained) should not extend on the coronal surface more than half way back, nor on the anterior aspect more than half way from the crown to the gum. Tubes are then placed in the roots of the cuspids and allowed to project about three-eighths of an inch. An impression of the mouth is next taken in plaster, in which the tubes will come away, and it is cast and opened as usual. The plaster teeth and roots are now trimmed, so that the cuspid caps and molar

Digitized by Google

crowns when made will pass a little way beneath the gum margin. The pattern of cap and band for the cuspid is the "Richmond," and care should be taken that each is made level with the gum on the labial side. (Fig. 26.) Hard gold or platinum tubes are next soldered to them in lieu of the ordinary posts of single "Richmond" crowns. The

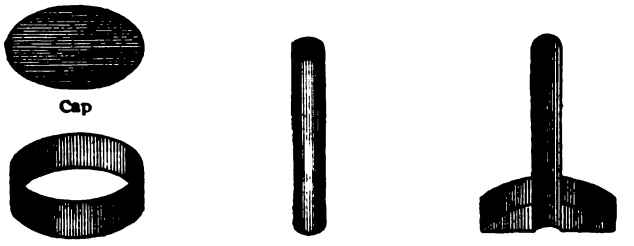


FIG. 26.

fixing of these with cement in their proper positions, and the operation of sealing the apical ends with gold or amalgam, complete the preparation of the roots. They are then ready to receive their posts (Fig. 26). A "Melotte" die of each molar is next taken and a gold color made to fit it. This collar is notched on its anterior surface to suit the corresponding depression on the same surface of the natural

FIG. 27.

tooth; the band is put on the "Melotte" cast and a piece of No. 30 pure gold is placed over the crown and burnished to fit its upper surface and the floor of the notch referred to. When this is soldered to the collar, it gives an all gold crown without cusps. A pure gold cap is next struck up and filled in with coin gold; it is ground level on its under surface and is in turn notched at the same part as the gold crown

Digitized by Google

already made. Having adjusted it to the latter, solder together, and you have an ordinary all gold crown, plus the recess on the crown and anterior surface (Fig. 27).

These crowns are cemented upon their respective teeth. Posts with bent ends are now placed in the cuspid tubes and allowed to project from them about three-eighths of an inch or more. A plaster impression of the whole is now to be taken and the pins will come away in it if the direction of the cuspid tubes have been carefully considered. (Before casting the impression, slip a small piece of metal tubing of

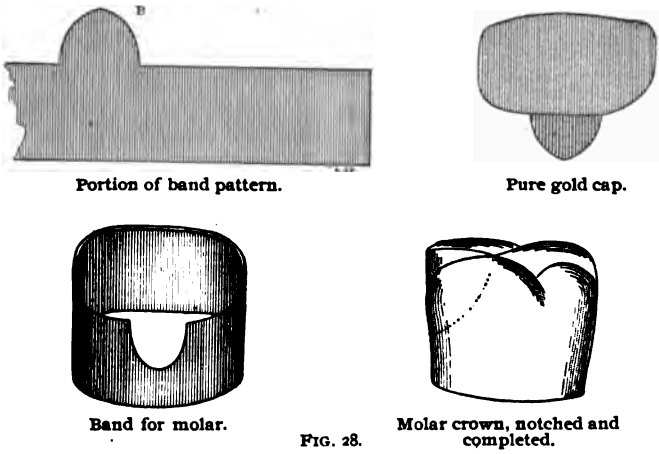


FIG. 28.

such a size as will exactly fit the posts over each; this will prevent any alteration in their direction when they have to be withdrawn and replaced in their sockets during the making of the bridge.)

Having cast, opened and hardened the model, proceed to make the clasps for the fixed molar crowns, as follows: First, take a "Melotte" die of each tooth, and cut a pattern as in Fig. 28, being careful to leave a portion of it (B) high enough above the level of the tooth to permit of its being bent down and accurately fitted into the notch. The clasp is next fitted to the tooth and the portion (B) is thinned down with a file and punched till it fits into the depression as just indicated. It is now strengthened and con-

Digitized by Google

toured to the normal shape of the crown by the addition of pieces of hard gold soldered together with 21 carat solder. This forms a strong partial cap or spur, which bearing on the gold crown, prevents the bridge's settling too hard upon the gum. It is better to make the band and spur from one piece of metal, as shown in Fig. 28, than to solder the spur to the band when fitted, for by the former way the continuity of the metal is unbroken. The clasp must be prolonged posteriorly to grasp the distal surface of the crown, in order that any tendency on the part of the tooth to backward movement, by pressure on the spur (which will thus act as an inclined plane), may be prevented.

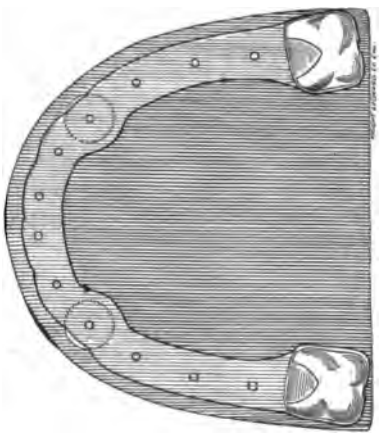


FIG. 29.
Plan showing bridge-plate.

Now proceed with the swaging of the plate, which is made of two thicknesses of metal. Make the first one No. 24 gauge and about five eighths of an inch wide all round. It must be struck up sharply and made to cover the cuspid caps. Next take a piece of plate, No. 26 gauge, and a trifle narrower than the first, and strike it over the latter. When fitted solder the two together with 21 carat solder, and trim the thick single plate thus produced to the shape shown in Fig. 29. After having seen that the plate fits, drill it through opposite each cuspid tube to receive the posts, which are introduced into the tubes and allowed to project through the drill holes on the lingual surface. Now adjust the clasps and place a little plaster round them and the cuspid posts. When it is hardened, remove the various parts from the model, stick them in their respective places, invest and solder with 20 carat.

A more true relation of the different parts of the bridge at this stage can be got by doing the operation of "taking

Digitized by Google

off" in the mouth. This is, indeed, the better plan, but it necessitates another visit from the patient. When bands and pins have been soldered, try the bridge in the mouth and take the bite. Select suitable tube teeth and fit them as in ordinary plate work. (Fig. 30.)

If the cuspid tube-tooth posts be thicker than the size of pin wire, they are to be reduced by the file to suit the porcelain teeth.

Modification of this method can be used in the construction of any removable tube-tooth bridge. The point to be most noted is the treatment of the molars, a plan which can be adapted to suit any of the posterior teeth. It most surely prevents the "settling" of the denture and the tendency to movement on the part of the natural teeth.

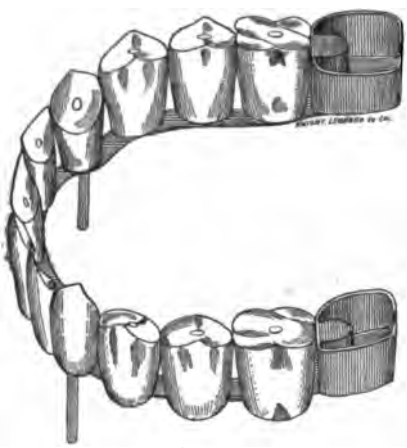


FIG. 30.
Side view of teeth on bridge-plate.

Fixed Bridge-Work.—Fixed bridge-work offers but a limited scope to English tube teeth for they can, as a rule, be used as substitutes for the masticating teeth only, or, at most, behind the laterals. As already mentioned, the obstacle to their utilization in restoring the front teeth is the much discussed self-cleansing space, which cannot readily be got by any all-porcelain crown for reasons which render useless the adaptation of Logan, Bonwill and other crowns to like purposes. The idea must not be formed, however, that the tube teeth can never be used here. In point of fact, they can, but on account of the shape of a front tooth which necessitates a short and weak lingual surface, often to be further destroyed to accommodate the bite, it has always seemed to me inadvisable to use them except in the few exceptional cases where the bite of

Digitized by Google

the lower teeth strikes abnormally far in. Here they may safely be applied. Fig. 31 represents the kind of case in which a fixed bridge with English tube teeth answers admirably. The gap in the dental arch extends from the third molar to the first bicuspid. The first bicuspid is banded and capped and a pin (which acts as post both to the root and tube crown) is soldered through it. A gold crown is fitted to the third molar and a strong oval shaped 22 carat gold bar, which will connect the crown and cap and ultimately carry the teeth, is made. This bar ought not to rest on the alveolar ridge but must be about one-sixteenth of an inch from it, and its angle with the alveolar border ought to be as represented in the section shown (Fig. 34). Such a slope downwards from the lingual to the labial side will secure a perfect self-cleansing space. The anterior end of the bar must now be soldered, not only to the bicuspid cap, but also to the base of the post itself, so that the strain may be borne by both.

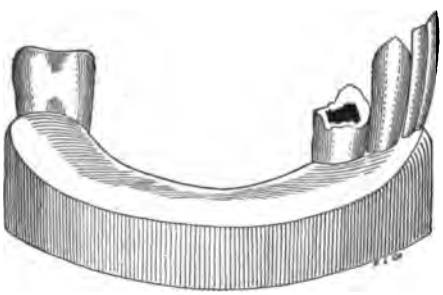


FIG. 31.
Mould for fixed bridge.

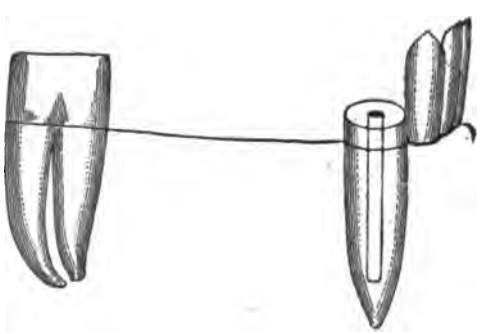


FIG. 32.
Posts trimmed.

So far, then, the bar and bicuspid cap are in one piece, the molar crown remaining unattached. Place these in their relative position in the mouth; do any adjusting that may be necessary between the molar crown and the posterior end of the bar; take them off with plaster as just

Digitized by Google

described in this operation in plate bridge, and solder. A bite must now be taken, and the teeth set up on the bar in the usual way, being fitted to it and allowed to overhang its buccal edge, as represented in the section (Fig. 34). When the teeth have been cemented to place with sulphur, the bridge had best be fixed temporarily in the mouth till it has proved satisfactory, when it may be fixed. A fixed bridge like this may be inserted on either side of either jaw, and modified to suit such exigencies as intermediate roots, etc.

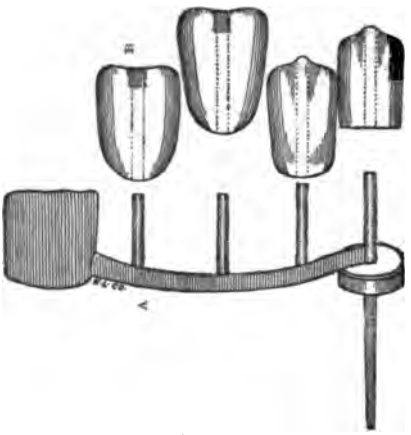


FIG. 33.
Bridge with teeth ready for fixing.

It must not be concluded that the possibilities of tube work have by any means been exhausted in this essay. They are at once seen to be limited by the fault in construction of the front teeth mentioned previously and shown in Fig. 1, A. One would almost suppose that the manufacturers themselves had seen this defect, for they (Messrs. Ash & Co., Ltd., London) have lately been making a porcelain crown almost identical with the tube tooth described by me in this paper. Be that as it may, however, this special crown deserves a word or two on its own behalf. It is made to replace front teeth and bicuspids. The bicuspids are well designed; but as much cannot be said for the fronts, for although the position of the tube has been corrected, the crown is still comparatively worthless, on account of its needlessly weak lingual wall, further undermined in many cases by a too much counter-sunk base. Because of these, to me, very serious defects, I have never used the new crowns, so I do not on

FIG. 34.
Section on line A–B.

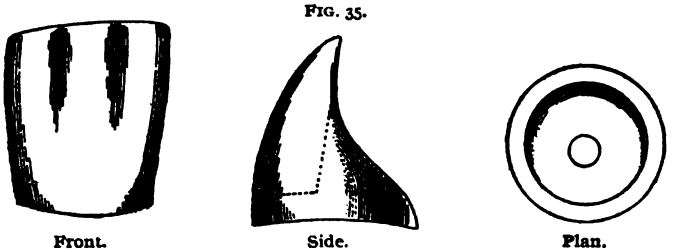
Digitized by Google

this point speak from experience. Despite their introduction, an improved tube tooth is called for.

A point of great moment to the tube worker is the alloys of gold for posts. In plate work these are made by English dentists about eighteen carats fine. This comparatively poor grade of metal is good enough for plate work, but in crown and bridge work something finer is required. For these the qualities most to be aimed at in alloying are toughness and non-liability to tarnish. Color, as indicating purity, is of no importance, so that no alloy should remain unemployed on that account. Different men employ different proportions, but from experience the author recommends

ASH'S NEW TUBE CROWN.

FIG. 35.



Front. Side. Plan.

the use of English coin gold, alloyed with from one and one-half to two dwt. of platinum to the ounce, for *all pins, posts, plates and bars.* This alloy is so infusible as to admit of soldering with coin gold twenty-two carats fine.

The use of sulphur as an agent for fixing teeth on plates and bridges is strongly advocated. Round the question of preference between this substance and cement a wordy warfare might profitably be waged. Let it suffice here to say that as a general rule, except in crowns and other situations where it cannot, from its very nature, be employed, sulphur is far and away the better of the two materials. It will stand in mouths which are death to the very best cements, because none of the oral fluids destroy it. Again, when repairs have to be done where cement has been the fixing medium, the teeth can only be removed with great force by pliers, obviously a very unsafe proceeding. Indeed, if the

Digitized by Google

pin and tube have been well roughened, the teeth cannot be, in many cases, got off without fracturing them. By the use of the agent advised, all this trouble is prevented, for when the plate comes to be repaired, you have only to heat it carefully and gradually till the sulphur melts, when the teeth may be easily lifted from their pins, and refixed when the repair is effected.

It may be objected by some hypercritical individual that the appearance of the pins on the coronal surface of tube teeth seriously affect their value prosthetically, that, as was once said, it does not look well to see what seems at a glance a black mark in the centre of all the back teeth. This, if objected to, may be overcome very easily. Having cut as much off the pin as you think fit, without impairing its function as support to the tooth, take a white glass or porcelain rod of proper size and insert a piece of it in the tube over the pin. This ought to be done before the teeth are finally fixed, so that the section of glass or porcelain will be firmly held by the sulphur. When finished the most critical observer will hardly detect any break in the color of the crowns if the inlays have been well matched.

The writer of this paper regrets that he has taken up so much of your time, but he feels himself warranted in doing so by the importance of his subject. To dentist and to patient the tube tooth yields such results as cannot be got from any other substitute for our lost ivories. What more can an operator wish when he has presented to him for use a tooth differing essentially from the natural one in but one respect—that it does not live? What more does the patient demand than that having his dental apparatus restored as far as utility is concerned, he is at liberty to laugh and chat to his heart's content, without betraying the fact that he owes his perfect comfort, not to nature, but to art? It is no exaggeration to say that in the use of the tube tooth such a happy state of things is realized. It is my opinion, formed on long experience, that, were these teeth once to gain a footing in bridge work, they would immediately find favor with all men who devote themselves to that depart-

Digitized by Google

ment of our professional work. The methods available to the prosthetic dentist are neither so complete nor so many as to be above improvement, both intrinsically and numerically, and in the interests of advancement I confidently recommend to you the English tube tooth. For, gentlemen, as applied to plate, crown and bridge work, it is a string to our bow inferior to none and superior to most.

THE PRESIDENT. The next paper in order is that of Dr. Fillebrown.

DR. FILLEBROWN. Before reading my paper, I desire to say a few words by way of prelude, to show the gradual and great increase of interest in the scientific world upon this subject.

In 1889 a paper upon this subject and its remedial effects was read before the British Medical Association by Dr. Augustus Voisirs. It was received with ill disguised incredulity. In 1890 there were several papers on hypnotism read before the psychological section of the same Association, and on the day they were read all the other sections of the Association were deserted, and that section was overcrowded. Until a few years ago, the *British Medical Journal* had spoken derisively of the application of hypnotism to medicine. About one year ago there came out in its editorial page a statement like this, "Hypnotism has come to stay. It is deserving the attention of every thoughtful scientific man." How is it in our own country? Last year at the American Dental Association, there was a volunteer paper presented upon that subject to the committee. It was ruled out under an old and almost obsolete rule. It was not pressed and consequently was not heard from. To-day this subject is chosen for the World's Columbian Dental Congress as the one which is most likely to interest the largest number, and the attendance to-day shows that the members of the Congress endorse the decision of the committee. I predict that in five years from this time the practice of every intelligent dentist in this country will be governed by the principles of hypnotic suggestion.

Digitized by Google

HYPNOTIC SUGGESTION AS AN OBTUNDENT AND SEDATIVE.

By Thomas Fillebrown, M.D., D.M.D., Boston.

It has fallen to my lot, I believe, to first observe that suggestions made to a patient during the wakeful state, and during the light degrees of hypnotic sleep, are sufficient to produce insensibility in dentine, and also the first to demonstrate its application to the practice of dentistry.

Many years ago it was demonstrated that in the very deep hypnosis which obtains with a very small percentage of patients, the anæsthesia was sufficient to operate on sensitive dentine, without pain to the patient, to extract teeth and to perform minor and major surgical operations without the patient's knowledge. But I know of no record that suggested anæsthesia during light hypnosis, which leaves consciousness unaffected and the mind alert, have ever been made useful and available as a dental obtundent.

In March, 1892, I accomplished this, and in April announced the discovery to the American Academy of Dental Science at its regular meeting in Boston, and in the following June I read a paper upon the subject before the Massachusetts Dental Society, which was subsequently published in the *Dental Review*, September, 1892.

For thirty years I had been familiar with the remedial effects of hypnotic suggestion, and was fully convinced hypnotism would be eventually made valuable for use in dentistry. But it was not until I had made "Bernheim's Suggestive Therapeutics"* an object of thorough study and reflection that the way opened for me to apply it for this purpose. My successful results were a joyful surprise to me, and have proved a great solace and relief to many patients since.

And with me it is at the present time a well recognized resource of relief for hypersensitive patients and a reliable obtundent for sensitive dentine.

* Suggestive Therapeutics. Bernheim. Paris, London, New York.

Digitized by Google

By its use I have rendered painfully sensitive dentine anæsthetic, and formed the cavity to my full satisfaction; and all the while the patient fully conscious of all that was going on, and fully realizing the obtunding effect of the suggestion.

The sedative effects of suggestion have also proved most salutary and efficient; and in most cases relieving the patient entirely of the terror which is so often the greatest hindrance to a successful operation.

Patients, who for years have been unable to sit in a dental chair, have had their fears removed and repeated operations performed without suffering, and at the close of each sitting have left the chair in better condition, mentally and physically, than after the previous visit.

A case in my practice this spring well illustrates the sedative and assuring effect of hypnotic suggestion.

A lady, about fifty years old, had, when a young girl, a pulp exposed, and her dentist had sought to remove it by immediate operation without any obtundent. The shock nearly paralyzed her. She said that for a few minutes she thought she was dead. Since then she has suffered such terror that it has been almost impossible for her to have any dentistry done, being ill after every visit to her dentist. Consequently she had lost many teeth, and needed much crown and bridge work and also several fillings. Knowing of my success with suggestion, she came five hundred miles to experience its benefits. She sat down in my operating chair dejected, depressed, terror-stricken, her extremities cold, cold perspiration was standing out on her forehead and her pulse rapid and weak.

I hypnotized her and suggested relief, and in five minutes all fears were removed, her physical functions were restored to their normal condition, and she was enjoying a sense of comfort and able to bear the grinding of teeth with a corundum disk without disturbance; and by successive repetitions of the hypnosis and suggestions she was able to occupy my chair over twenty-one hours within six days, and improve each day, and on her return home was able, as she

Digitized by Google

wrote a friend, "to at once answer her accumulated correspondence instead of going to bed, as usual after a dental operation."

At one sitting she wished me to examine a tooth. As it was pulpless and not sore, I thought to examine it without hypnotic suggestion, but as I had not suggested as to this special tooth, her old terror returned, and she was utterly unable to let me proceed. I hypnotized and suggested relief, and her fear was gone and I completed the examination without trouble.

One other case illustrates the lasting effect of suggestion over fears of more recent origin:

A young lady, twenty-two years old, had, a few weeks before her visit to me, undergone an attempt made to extract a tooth. The operator did not succeed in removing the tooth, but persisted in his efforts until the patient was partially conscious. The result was a state of great fear which nearly disabled her during the day and rendered much sleep at night impossible. As soon as she would fall asleep the horror of some one wrenching at her tooth would bring her sitting upright in bed. She persisted she never could have her teeth touched again, or again take an anæsthetic. Her sister finally persuaded her to see me, promising that I should do nothing without her asking. I talked with her awhile, when she consented to be hypnotized. She hypnotized quite deeply—memory gone. I suggested removal of fears and a willingness to take some ether, and absence of any dread of the extraction of the tooth. In five minutes I woke her, and immediately after answering me a question said, "I will take the ether." I immediately prepared the ether sponge, hypnotized her again, and suggested comfort during the inhaling of the ether. I carefully administered it while she was still hypnotized. She did not seem to experience the slightest discomfort.

I extracted the teeth readily and the patient recovered without terror or distress. Before I discharged her, I hypnotized her again and suggested good sleep without dreams or fears for the coming night. She returned home and dur-

Digitized by Google

ing the night and next morning enjoyed a peaceful, restful sleep of twelve hours, waking only once during the time. She was hypnotized again the next day, and good sleep, undisturbed by terror or dreams, has been her experience ever since.

The following illustrates the effects of suggestion upon another class of cases:

A married lady, about thirty-five years old, has been a sufferer for many years with rheumatism, and is consequently considerably reduced in physical strength. Her nervous system has suffered especially. Her teeth have been extremely sensitive; consequently without any special or sudden shock, she had come to find it impossible to have any dental operations performed, and for two years her teeth had been entirely neglected.

She came to me last autumn hoping for relief. She sat down in my operating chair in a state of great trepidation, trembling and perspiring. She was too much excited for me to attempt to even partially hypnotize. I simply placed my hand on her forehead, and requested her to close her eyes, and then audibly suggested quiet, rest, absence of fear and confidence.

In five minutes she was entirely calm and quiet. I then further suggested anæsthesia of the teeth, and was able to excavate two cavities and fill with gold at this sitting, and a number more at subsequent sittings. At the close of the last sitting the patient was in a very much better condition than at the close of the first visit.

This patient I was unable to hypnotize by aid of fixation of the gaze, but by the repetition of the method first employed, I was able to produce a suggestible condition that maintained anæsthesia of the teeth and a state of comfort for the patient, and "a complete feeling of don't care," as she expressed it. As I have longer practiced hypnotizing patients I find a larger number who are better and more deeply affected by this method, and I am inclined to think the fixation of the gaze, which is so much depended on, will cease to be considered so essential as it is at present.

Digitized by Google

These three cases are typical. They are specially favorable and among my most successful. Still I have had a large number equally so to keep them company. Suggestion is not a "cure all." Some patients cannot be made suggestible. The teeth of some patients who are hypnotizable cannot be anæsthetized.

One patient I have is a lad of fifteen. He hypnotizes to a state of deep somnambulism every time. The loss of memory is so complete that he has never remembered anything that I have said or done during the hypnosis, and feels exultant that he has had his dentistry done without suffering. Still I have been unable to render the dentine scarcely less sensitive apparently than when awake, and he shrinks nearly as much. This case is entirely exceptional.

While suggestion is not of universal application, yet summing up the favorable effects on the sensitiveness of the dentine, and the very favorable sedative influence on the nervous system, it proves for me the most efficient dental obtundent that it has been my privilege to try.

In my paper referred to, I reported an analysis of twenty-one cases showing my success. My subsequent experience has fully corroborated this favorable showing. The number of patients was twenty-one. One failed to hypnotize, consequently the summary applies to twenty patients. In every case I proved that the teeth were very sensitive. Hypnotic suggestion applied thirty-eight times to twenty patients.

Full anæsthesia of the dentine obtained twenty-one times for eight patients, or forty per cent. of the whole number of patients.

Anæsthesia of dentine not quite complete, but practically successful, twelve times for seven patients, being thirty-five per cent. of the whole number of patients.

Anæsthesia completed with local obtundents, six times to five patients, or twenty-five per cent. of the patients. Suggestion successfully applied; once for removal of necrosed bone; five times for extracting teeth, one tooth at each operation; once for operation on alveolar abscess;

Digitized by Google

for removal of dread of taking gas, once successful, once unsuccessful. I have many times since removed all dread of anæsthesia, and also prevented the nervous fear that is likely to obtain upon waking up.

It is impossible to indicate in any table all the benefit that accrues to the patient from the hypnotism.

In every case there was almost complete, and in most cases entire, relaxation of nervous and muscular tension, so that the patient rested during the operation instead of being exhausted. Almost every person left my operating chair, saying he felt better than when he sat down. I always suggest that the patient is resting, will wake up refreshed, will be undisturbed, and this result usually follows. If by chance a different result obtains, I at one hypnotize again and correct the error. This has occured in a few instances, but thus far I have not failed to relieve the discomfort.

Another distinct gain has been described by several patients independently, viz.: When any pain is felt, it is sensed only at the point of contact of the instrument, and not over the whole system as is generally the case. If a tooth is extracted, there is no dread felt before the operation nor shock produced by it, only a little twinge felt the instant the tooth is being pulled.

A worthy Scotchman expressed himself to the point, after having a tooth extracted under hypnotism, "I rather think it helped me; it kind of reconciled me down to it."

The operation for necrosis mentioned was for a patient whose nervous system was much broken down. Any excitement, from sorrow, fear or joy, would invariably cause her several hours of nervous excitement and distress, entirely disabling her at the time. The hypnosis prevented any unfavorable results from the operation.

I do not presume to rely on suggestion as an anæsthetic for extraction of teeth. I occasionally try it for one single tooth, and if the patient willingly opens the mouth and submits to the operation, I feel sure of success. I have never tried it for more than one tooth at a time. The Caucasian race in the temperate zone does not seem to hypnotize as

Digitized by Google

deeply nor accept the suggestions as implicitly as do the eastern races of the torrid zone. I find many patients suggestible without any attempt at hypnosis, so that by simply verbally assuring the patient that the dentine is anæsthetized, it can be cut without the patient suffering. By the same means fears will be removed, the palpitating heart stilled, and a feeling of repose and quiet made to succeed a storm of excitement.

In one case I reduced the pulse twelve beats in less than three minutes, and removed just as quickly what seemed insuperable fear of an anæsthetic. This is only a repetition of similar experiences of other hypnotists. It is only utilizing one of the elements of the human mind, which has now become to be well understood by all students of mental philosophy.

The power to use this agency of suggestion, either in the wakeful or hypnotic state, is not, as many suppose, confined to a few, nor is it any special gift or acquirement. It is one of the faculties of the mind, and much in the same sense as is the mechanical, mathematical, literary, or artistic ability.

The average man can become a capable hypnotist, and at least three-fourths of the practitioners of dentistry may, by proper study and application, make it exceedingly useful. I had occasion recently to instruct some young dentists in the art of hypnotizing. Six sat down, two at a time, as subjects, and another six became operators. Four of the operators were entirely successful, and fully hypnotized their subjects. The two last failed of complete success for lack of time which caused a hurried feeling, which is inimical to any approach to the hypnotic condition. Any one of good understanding and fair ability can use the elements of suggestion in the form taught by the philosophy of repose, or the so-called devitalizing process. Several of my patients have attained to the power of autohypnotization by the practice of these methods, and have rendered their dental operations comparatively painless. Also some of my professional friends

Digitized by Google

have found themselves able to give their patients great relief by suggesting this method while operating upon their teeth.

There is no fear among patients or operators to prevent the practice of this, and it will eventually prepare the way for the more potent suggestion under the hypnótic condition. At present prejudice and fear, begotten of ignorance and misinformation, prevent the dental profession from obtaining the benefits following the use of hypnotic suggestion. Consequently it is fortunate so much benefit can be obtained by the less pronounced forms which commend themselves to the most timid.

The fancied dangers attending hypnosis have a great influence in preventing its use. The real dangers are few and wholly avoidable. Liébault says, "The accidents in hypnotism are wholly due to the ignorance or giddy tricks of the operator." And Moll affirms, "It is insufficient technical knowledge that is dangerous, not hypnotism. Hypnotism properly used is as harmless as electricity properly used."* No danger or ill effect ever accompanied or followed its administration by a reasonably competent and honest operator.

The condition itself is not in the least dangerous. The patient is put into a quiet sleep, being light or deep as the susceptibility of the subject may determine. The patient is comfortable and resting, and if left alone will, usually in fifteen or twenty minutes, wake spontaneously as from natural sleep. The hypnosis wears out. The patient may feel drowsy for sometime longer, but soon returns to the former condition of wakefulness, but the quiet, calming influence of the hypnosis is sure to remain.

No sensible man will deny that harm may be done with hypnotic suggestion. There is nothing good under the sun which may not do harm or become evil by misuse. The commonest blessings of air, water and warmth become in the tempest, the flood and the conflagration, the greatest evils. Nutritious food becomes a bane to the overloaded

* Moll on Hypnotism. Walter Scott, London; Charles Scribner's Sons, N. Y.

Digitized by Google

stomach, and heat and moisture produce a pestilence from the bounteous products of the soil.

Anæsthesia often produces direful results—yet it is a wonderful blessing, so like Juliet's wine, that:

"Through all thy veins shall run
A cold and drowsy humour, which shall seize
Each vital spirit; for no pulse shall keep
His natural progress, but surcease to beat:
No warmth, no breath, shall testify thou liv'st;
The roses in thy lips and cheeks shall fade
To paly ashes; thine eyes' windows fall,
Like death when he shuts up the day of life;
Each part, deprived of supple government,
Shall stiff, and stark, and cold appear like death:
And in this borrow'd likeness of shrunk death
Thou shalt remain full two and forty hours,
And then awake as from a pleasant sleep."

In predisposed cases chloroform, ether and gas have caused sickness, insanity and death. Yet every surgeon uses them, and every patient expects and desires them. Opium and alcohol are also dangerous—a thousand times more dangerous than suggestion. They do their evil when used for good purposes by innocent and well-intentioned persons, and have usually done their work before the victim or physician is aware of it; but hypnotism can do no harm unless the ill result is carefully planned, and knowingly and deliberately brought about. An operator that could do this is basely vile and can hardly be found in any branch of the medical profession.

Suggestion will cure headache and it will also cause it. Suggestion will relieve tonic contraction of the muscles, and it will also cause spasms of the same organs. Suggestion will stimulate to elevating thoughts and mental activity, and it will induce mental inactivity and excite debasing imaginations. It has been said hypnotism ought not to be used until better understood. Upon that premise no man could think another thought. For there is no understanding of even how a thought is produced, nor do we understand any mental process; we only know what we observe of mental phenomena.

Digitized by Google

No competent operator need have any fear for himself or his patient. Average ability, fair knowledge of the subject and honesty are sufficient safeguards for both the operator and his patients. It is said the rash, foolish and unprincipled may abuse it. True. But this is all the more reason why the conservative, wise and high-minded physician should snatch it from such unworthy hands.

I do not believe in letting the devil have a monopoly of all the valuable things of this life.

Not many years ago anæsthetics were used to make ludicrous exhibitions of persons for public entertainments; yet no one on that account refused to use them to assuage the agonies of a painful operation.

The rash, foolish and unprincipled have used hypnotism for many years, and to-day use it to make amusing and profitable entertainments; but this is no reason why suffering humanity should be denied the blessings of the remedial effects of this wonderful curative agency. To me it is a wonder that fifty years ago scientific men should have been so blind as to have given it over so completely into the hands of the unprincipled and uneducated classes.

While it is true that extreme cases have been found where control was obtained and violence done to the subject, it must be remembered that the patients in every case know what is said and what is done, and also what they do. In a few cases only the memory does not bridge over from the hypnotic condition to the wakeful state, or the conscious self does not take sufficient cognizance of what is said and done to retain the impression. Now, as the somnambulistic state obtains in hardly one patient in ten, it would require a hardihood beyond compare, or an ignorance beyond conception, to presume upon it.

The propriety of witnesses being present when the operator and patient are of the opposite sex no one will question, but the necessity of it is greatly exaggerated. Nearly ninety per cent. of the patients are protected by their exalted perceptions and full consciousness, and the rest by the almost certainty of being aroused by any suggestion

Digitized by Google

against their convictions. In the exceptional cases the operator needs the witnesses for his own protection against designing patients, rather than the patient against him.

It is generally considered that hypnotism is not the best name for the suggestible condition which we are considering, but it has become so firmly fixed that it is useless to attempt any change or substitution.

Generally persons do not sleep in the ordinary sense of being unconscious, as in sleep at night. In the hypnotic condition the patients are fully conscious, their faculties are keenly alive, and their perceptions more acute than when in their usual wakeful state. Still the conditions of the nervous system are radically different.

We have said hypnotism is a misnomer, yet no one has suggested a better name. We call it sleep to induce it, and we call it sleep to continue it, and we call on the patient to wake when we wish to terminate it; hence it must be considered sleep, though in most cases not inappropriately conscious sleep. It has the quality of sleep.

The induction of hypnosis is a simple and easy matter. I use the method which has proved so successful with the Nancy school, and described substantially as follows by Bernheim:

"When I have banished from the patient's mind the idea of hypnotism, and the somewhat mysterious fear that attaches to that unknown condition, above all, when he has seen patients cured or benefited by the means in question, he is no longer suspicious, but gives himself up. Then I say, 'Look at me and think of nothing but sleep. Your eyelids begin to feel heavy, your eyes are tired. They begin to wink, they are getting moist, you cannot see distinctly. They are closed.' Some patients close their eyes and are asleep immediately. With others I have to repeat; lay more stress on what I say, and even make gestures. It makes little difference what sort of gesture is made. I hold two fingers of my right hand before the patient's eyes, and ask him to look at them, or pass both hands before his eyes, or persuade him to fix his eyes upon mine, endeavoring at

Digitized by Google

the same time to concentrate his attention upon the idea of sleep. I say, 'Your lids are closing, you cannot open them again. Your arms feel heavy, so do your legs. You cannot feel anything. Your hands are motionless. You see nothing, you are going to sleep,' and I add in a commanding tone, 'Sleep.' This word often turns the balance. The eyes close, and the patient sleeps, or is at least influenced.

"Many persons, as above stated, are influenced at the very first seance, others not until the second or third. After being hypnotized once or twice they are speedily influenced. It is often enough to look at patients, to spread the fingers before the eyes, to say, 'Sleep,' and in a second or two sometimes instantly the eyes close and all the phenomena of sleep are present. It is only after a certain number of seances, generally a small number, that the patient acquires the aptitude for going to sleep quickly.

"Some people can be hypnotized with chloroform before they are really under its influence. All surgeons have seen patients go to sleep suddenly without any period of excitement, after a few breaths of the anæsthetic, and certainly before it has done its work. In some cases the hypnotic sleep thus comes before the anæsthesia. If it is deep enough to cause complete anæsthesia, as I have seen it, the operation can be performed without delay; if not I keep on giving chloroform until the anæsthesia is complete, which takes place more rapidly, because aided by suggestion. By acting in this manner I also prevent the period of excitement in these cases.

"It is wrong to believe that the subjects influenced are all weak-nerved, weak-brained, hysterical, or women. Most of my observations relate to men, whom I have chosen on purpose to controvert this belief. Without doubt, impressionability varies. Common people, those of gentle disposition, old soldiers, artisans, people accustomed to passive obedience, have seemed to me, as well as M. Liébault, more ready to receive the suggestion than preoccupied people, and those who often unconsciously oppose a certain mental resistance. The idea of being hypnotized must be present; the patient

Digitized by Google

must submit entirely to the hypnotizer, using no cerebral resistance; then, I repeat, experience shows that a very large majority of people are easily influenced."

I have, I believe, verified all the phenomena observed by Bernheim, as to the symptoms of hypnosis and nearly all of his variations of methods of inducing it. I, myself, use my eyes more for a fixed point for the patient's gaze than the fingers. I find it more agreeable to the patient. It seems to them more sensible, and unless the operator is likely to be hypnotized himself it is, I think, the better. Laying my hand on the forehead and over the eyes to close them and exclude the light, is very successful with me, and much preferred by many, and very often is more effectual. In these cases audible suggestion is used same as in others. I find the fixation of the gaze much less necessary than formerly, and now by no means essential.

The awaking from the hypnotic sleep may be instantaneous. In my experience the patient will wake up from light sleep any time when I leave him for a moment, unless I particularly suggest a continuance of the sleep; but the majority of subjects left to themselves sleep on for several minutes, for a half hour or even one or more hours, when the sleep will terminate spontaneously.

For most patients the simple suggestion "wake up" is quite sufficient to terminate the condition. Occasionally it may need to be repeated perhaps a little more emphatically. If the arousing is sluggish, fanning or blowing on the face is useful, with the command "wake up" repeated A slight shock, or a slap on the arm, will quicken the termination of the condition. No hypnotist of good technical knowledge has ever had any difficulty in arousing the patient from the hypnosis at will.

An important question for dentists is, How to maintain the hypnosis and induce the anæsthesia of the dentine while operating on the teeth?

I have found that all writers upon the subject, as far as I could learn, state that pain would always wake the patient from the hypnotic sleep, unless such patient was in a som-

Digitized by Google

nambulistic condition. I felt it might be possible to derive distinct benefit in the lighter stages if they could be kept continuous. I soon believed it possible, and after diligent study I commenced to hypnotize, and my first effort proved a success, the patient reaching the second stage.

And then I made the discovery that continuous suggestion makes it possible to keep a patient hypnotized, and the dentine wholly or partially anæsthetized for a full preparation of the cavity during the light sleep of the first and second degree. I am not aware that this has ever been made successful before.

I maintain the hypnosis and the anæsthesia by a constant repetition of "Sleep, sleep; you are resting, you are not suffering, you are not dreading it, you do not care for it; sleep, sleep," and so on continuously as long as the condition is desired. It is practically a continual rehypnotizing to offset the continual waking caused by the cut of the instrument.

Sometimes the hypnosis will wear out in spite of continual suggestion, especially if the operator's attention is too wholly absorbed in the operation and his suggestions become weak. In such a case I stop and hypnotize again. I have hypnotized as many as six times at one sitting.

If the sitting is long and the hypnosis deep, the patient is likely to get tired, and I have found it better to wake them up at intervals for rest, or suggest a change of position, but the waking is much better. By making this conservative use of hypnotism, the patient in every instance will feel rested and stronger at the close of the sitting than before, and will improve in courage and quiet as the sittings succeed each other, and in many cases the need of hypnosis will cease to exist and the patient submit to the operation in the wakeful state without shrinking.

I had a case lately that illustrated it. A girl fourteen years old had feared dental operations so much that for two years she had not been able to have her teeth even cleansed. Hypnotism made cleansing, preparing and filling easy, and at the fourth sitting she had become so indifferent that she

Digitized by Google

was quite willing to have a large cavity in a molar prepared and filled while fully awake. Others have experienced the same benefit.

These results have, it seems to me, proved that in my hands hypnotic suggestion, as a sedative and as an obtundent, is a marked success, and, I believe, equal and greater successes may be achieved by many other operators when they make intelligent effort to accomplish this desired end.

The physiology of any mental state or mental action is but little understood beyond a familiarity with the phenomena displayed. We are no better nor worse off with the hypnotic condition. The phenomena of hypnotism has been observed scientifically for more than one hundred years, and many facts established.

Mesmer, in 1778, announced the discovery of producing this condition at will, and announced his theory of animal magnetism.

In 1841 Dr. James Braid described this mesmeric state and called it hypnotism, and placed the subject on a truly scientific basis, and definitely established that suggestion was the sole cause of the condition.

Braid proved that no magnetic fluid exists, and that no mysterious force emanates from the hypnotizer. He further proved that the hypnotic state and its associated phenomena are purely subjective in their origin, and this origin is in the nervous system of the subject himself.

Braid's suggestions were based upon the expectancy of the patient. Hence there was less certainty of benefit than exists at the present time.

In 1860 Dr. Liébault, of Nancy, commenced the use of hypnotism, and soon discovered that audible suggestions addressed to the patient heightened the effect, and made the results more uniform and certain.

This is now the almost universal practice. It seems established that hypnosis is entirely free from danger, and its effects upon the patient, if left undisturbed, is the same as ordinary sleep.

Digitized by Google

The great essential feature of hypnotism is not sleep, but a heightened receptivity of suggestions with or without sleep; in other words any suggestion offered to a person during hypnosis has an exaggerated effect on the mind. But up to a certain point, that of lethargy, the deeper the sleep the greater the effect of the suggestion.

In hypnosis the power to initiate any volition is in abeyance. The mind will be directed from the old channels and follow a new line of thought; it will exert its physiological force as directed by the operator.

The mind seems to become non-resistant, and old thoughts are held in abeyance, and new thoughts are suggested and received to hold control, so that sometimes during a single hypnosis, a condition directly opposite to that which previously existed may gain permanent control. Courage may succeed fear, rest replace fatigue, and sweet, natural sleep come to the patient instead of wakeful hours of restlessness.

Liébault's idea is that "ordinary sleep does not differ from hypnotic sleep. The one is, like the other, due to the fixation of the attention, and of the nervous force upon the idea of sleep. The individual who wishes to sleep isolates his senses, meditates and remains motionless. The nervous force concentrates itself, so to speak, at one point of the brain upon a single idea, and abandons the nerves of sensation, motion and special sense.

"But the ordinary sleeper is in relation with himself only, and as soon as consciousness is lost the impressions conducted to his brain by the nerves of sensibility or of organic life, may awaken diverse memory-sensations or images which constitute dreams. These dreams are spontaneous, that is to say, suggested by himself.

"The hypnotized subject falls asleep, with his thoughts fixed, in relationship with the hypnotizer; hence the possibility of the suggestion of dreams, ideas and acts, by this foreign will."

I close this part of the subject with a statement of the theory of Despine, which seems to me founded upon clinical

Digitized by Google

observations. "There exists," says this author, "an automatic cerebral activity which manifests itself without the concurrence of the ego; for all nervous centers possess, in accordance with the laws which govern their activity, an intelligent power, without any ego, and without personality. In certain pathological cerebral states the psychical faculties may manifest themselves in the absence of the ego, of the mind, of consciousness, and may give rise to acts similar to those which normally are manifested through the agency of the ego. This is automatic cerebral activity. That which manifests the ego, on the contrary, is conscious cerebral activity. In the normal condition these two activities are intimately bound together; they are but one, and always manifest themselves conjointly. In certain pathological states they may be separated and act alone.

"Hypnotism is characterized physiologically by the exercise of the automatic activity of the brain during the paralysis of its conscious activity."

That you may see my progress in the art of hypnotism and better understand the anæsthetic effects of hypnotic suggestion, I give the following description of cases in my practice in the order in which they followed each other:

Case 1.—In 1892 my first attempt to hypnotize for dental purpose was for Miss L——, age twenty-two, to remove a pulp after arsenic application. She hypnotized in about one minute to the first degree; very light sleep. I suggested anæsthesia of tooth and cuts. It lessened the pain very much; but I could not overcome all the sensitiveness of the pulp, nor have I been able to do so since in any case. A month later I hypnotized and suggested for relief of toothache and restfulness, as she was very weary. I awoke her in five minutes, and found her toothache gone and herself feeling entirely rested and refreshed.

Case 2.—Mrs. L——, age thirty-six. I induced only very slight sleep. I suggested for anæsthesia of sensitive dentine. The pain during the previous operations was almost unbearable. They relieved sensibility very much. It made the cutting of two cavities on buccal surfaces of inferior

Digitized by Google

bicuspids with both excavator and bur very easily borne. The suggestion did not last long, and hypnosis and suggestion had to be repeated several times.

Case 3.—Miss C——, age fifty. The patient was suffering from necrosis from abscess on right superior incisor. Her upper teeth had all been extracted five months before. The patient had nervous collapse seven years before and has since suffered repeated attacks. Any excitement of sorrow, or joy or fear, or a pleasant hour with callers, would bring on a nervous spasm which would last one or two hours. Ether had an unpleasant effect upon her, and she preferred the operation without an anæsthetic on account of nervousness. I hypnotized her to the first degree, bordering on the second; I also applied cocaine to the gum; I then incised and removed a section of the gum; trephined the alveolar wall and removed spiculæ of dead bone. The operation lasted from seven to ten minutes. The patient lay quietly, scarcely flinching; her dread all gone, and upon waking up she pronounced herself comfortable during the operation, suffering no shock, depression or weakness.

I did not think to suggest against subsequent pain, and some pain persisted in region of the wound, also in her temple and ear of same side. I hypnotized her the second time and relieved the pain in wound and face. I waited twenty minutes, thinking the rest of the pain would subside; but the pain in her ear persisted. I hypnotized her the third time and suggestion relieved pain entirely, and the patient left my office feeling in very much better condition than before the operation. I saw her six days after; she had been getting along well, the wound was healing well and her nervous condition good; had some neuralgia of the head, face, arm and hand. I hypnotized her and suggestion relieved the pain entirely. Three days after this she had had no return of pain in the arm or hand; had suffered a little pain in the head. Hypnosis and suggestion relieved it again completely. At 4:30 called again. She had been very busy during the day out in the wind, and *tic* of right temple had returned and involved the eyes. I hypnotized twice and

Digitized by Google

completely relieved the trouble. The patient left town the next day, but subsequently I saw her and found relief from the pain proved permanent, also the general good effects of the hypnotism continued.

Case 4.—Mrs. P——, age forty-five. Right superior first molar abscessed. The crisis was past, but the tooth was very sore, the dead pulp remaining. The tooth needed drilling for removal of pulp. The patient dreaded the operation very much; she did not sleep the night before on account of it; and had a bad headache and neuralgic pains over the entire system. She hypnotized to the second degree; her dread was entirely gone, she suffered scarcely any during the operation; she was very comfortable and did not mind it at all; her systemic pain was also cured. I filled her tooth temporarily and hypnotized again, and suggested recovery without further trouble.

Four days after I found her tooth in good condition, and filled it permanently; I hypnotized and suggested for continued health of tooth and system. The tooth has since remained well.

Case 5.—Prof. O——, age thirty-five. Right inferior first molar needed to be extracted, as it was very badly abscessed. I hypnotized him to the first degree and suggested that pain of extraction would be lessened, his dread removed and shock prevented. The result fulfilled the prophecy.

Two weeks later he had a right superior bicuspid root which he had wished out for ten years, but could not get up his courage. I hypnotized to note effect on his mind; he soon opened his mouth without dread; I extracted the tooth; he said he felt no pain, only a little wrenching sensation, which was only local. He called it perfectly successful.

At another sitting I excavated and filled right inferior lateral incisor and cuspid; these were very tender indeed. I hypnotized him and suggestion relieved sensitiveness very much, and, with a local obtundent added, I made the anæsthesia complete. The patient said the pain was only local; did not disturb the system. He found it a great relief.

Case 6.—Dr. P——, dentist, age thirty-four. I filled for him

Digitized by Google

right superior cuspid labial cavity; exquisitely tender. He was unable to bear his finger nail on it. I hypnotized him to the second degree, light; suggestion made the anæsthesia of the dentine almost complete; the nervous and muscular relaxation was entire. I used excavator freely and burred with engine all round the cavity, and in twenty minutes from the time he sat in my chair the cavity was prepared. He found it a complete success. I subsequently filled for him right superior cuspid, mesial cavity, not tender; I did not hypnotize him at first. When tooth was nearly filled he said he felt broken up and was very much disturbed. I hypnotized him; suggestion made him immediately quiet and entirely relieved his discomfort.

Case 7.—Master G——, age ten. The patient was very sensitive and it was very uncomfortable for himself and all concerned. He hypnotized to the first degree, very light. It quieted him a good deal and made it possible to do a little, but my success was indifferent, largely due, I think, to lack of interest on the patient's part, whose mother had little faith in it. I hypnotized him for three sittings with about the same success.

Case 8.—Mrs. W——, age forty-three. Filled right inferior first molar, very sensitive. This patient was always very much disturbed by prospect and performance of dental operations. She hypnotized readily to the first degree, but full influence could be maintained but a little time; but a drowsy feeling persisted, all dread of operation was gone; I used bur and chisel without resistance or suffering on her part. She thought it a complete success.

A week after I hypnotized her with same process as before. I could not completely anæsthetize the dentine, but the addition of a little alcoholic vapor completed the insensibility.

Case 9. Mrs. C——, age twenty-nine. Condition, hypnotism and success the same as the last case.

Case 10. Miss H—— is a lady about forty. Her teeth had been always very sensitive, and for twenty years she had been troubled with insomnia; she was very nervous,

Digitized by Google

excitable and apprehensive. Her teeth were in bad condition, owing to neglect on account of fear and pain. She hypnotized to the third degree, somnambulistic; I suggested anæsthesia of dentine, which was complete. I operated April 9th, 12th, 21st, and May 7th and 16th. Hypnotic suggestion at each sitting.

May 28th, I gave her a short hypnosis at the beginning of the sitting, and one at the end, operating in the meantime on a post-hypnotic anæsthesia, which was complete. This method gave relief and comfort; some of the former hypnoses had proved wearisome. The incidental benefits derived from the treatment were very marked. Up to the date of her first sitting she had often been obliged to take some hypnotic to afford sleep. The night after her first hypnosis in the afternoon, she slept all night and far into the morning, and every night since, except three or four that she had some face ache. Her general condition is much improved, apprehensiveness much less, and nervousness much reduced, and has much better command of herself. Her improvement has persisted up to the present time (July 1st, 1893).

Case 11. Mr. M——, age thirty-two. Teeth very sensitive. Hypnotized to the third degree; suggestion made, anæsthesia of the dentine complete. Operated from an hour to an hour and a half at each sitting. At the close of the longer sittings he complained of feeling tired sitting so still; he thought an hour long enough.

Case 12. Miss P——, age fourteen. A refined, healthy, vigorous girl, but so afraid of dentistry she had not been able to have her teeth cleansed for two years. Her teeth were extremely sensitive. She called upon my promise that I would not touch her teeth. I talked hypnotism to her, interested her, and made an appointment to try it and operate.

May 28th, I hypnotized her to the first degree. Suggestion removed all fear, and I cleaned her teeth without any trouble and prepared and filled with cement two cavities in the front teeth.

Digitized by Google

June 11th, I hypnotized her again; prepared and filled with cement four cavities in front teeth. While excavating one of the cavities she flinched some. I feared discouraging her and waked her, and asked her if I should go ahead if it did hurt a little; she said, "I don't care; go ahead!" I hypnotized her again and finished according to the instructions.

June 17th, I hypnotized her twice; excavated three cavities and filled with gold; I used bur with engine without discomfort to the patient.

June 18th, I hypnotized and prepared one tooth, waked the patient and filled it. Then prepared and filled another molar while she was awake. The transformation was wonderful.

Case 13. Miss L——, age forty-two. She called on me in December, 1891, for a new upper plate. She had been wearing artificial teeth on rubber for three years. Her mouth had been constantly red with severe itching and burning. I made her a good fitting plate on rubber, but her mouth was no better. A few weeks later I made a gold plate, which she has worn since. It gave no relief from the burning and the redness persisted.

June 3, 1892, she called, seeking relief. I proposed hypnotic suggestion as an experiment. She was agreeable to it. I hypnotized her nearly to second degree. Suggested cessation of burning and change of color and return to health. She slept perhaps ten minutes. On waking, the mouth had changed color perceptibly, the burning gone.

June 24th. She had experienced discomfort only about one hour the evening of the 23d and again this morning about the same length of time. I hypnotized her again and suggested for health and comfort.

June 25th. She has experienced a little discomfort once for a short time since yesterday. Mouth still better. I suggested for complete recovery. I did not see the patient again until the 29th, four days intervening. Has had hardly any burning of the mouth since her last visit until to-day, rather more. Mouth seems much improved in color

Digitized by Google

and texture. Hypnotized and suggested for relief and cure.

June 30th. Mouth much better; no discomfort since yesterday. Hypnotized also on July 1st, 6th, 7th, 8th, 14th, and 21st.

July 22d. Her mouth has felt entirely well since June 30th; it is now normal in color save two small patches, which are a little red, but not at all tender or uncomfortable. The patient has worn her plate all the time during the treatment.

These cases fairly represent the extremes and average of the results in my practice of the application of hypnotism to dentistry. I believe it is a power of great value to my patients and may be to the patients of other operators who may practice it. I invite the attention and thoughtful consideration of every one present to the subject.

[The discussion on this paper will be found in the report of Section I on Anatomy and Histology.]

Adjourned.

Digitized by Google

SIXTH DAY, SATURDAY, AUGUST 19—NOON SESSION.

The session was called to order by President Shepard at 11 A. M.

The Secretary-General read the following resolution from the Executive Committee:

Resolved, That the thanks of the members of the World's Columbian Dental Congress be extended to the Honorable C. C. Bonney, President of the World's Congress Auxiliary; Clarence E. Young, Secretary, and Eugene J. Hazard, private secretary to Mr. Young, for the courtesies shown us during our stay in Chicago.

Unanimously adopted.

The President announced that the report of the committees below stated, would be read by title only, and would appear in the printed Transactions of the Congress.

Committee on the History of Dental Legislation in this and other Countries: Wm. Carr, M. D., D. D. S., New York, chairman. [Report printed at end of Volume II.]

The following committee reports were then read:

REPORT OF COMMITTEE NO. 21, ON THE CARE OF THE TEETH OF THE POOR.

Mr. President and Gentlemen:

It was recognized by the Executive Committee in organizing this Dental Congress and its work, that, while physicians and surgeons give their services regularly and systematically,

Digitized by Google

and without fee, to treatment of the poor and unfortunate, dental practitioners have no orderly and systematic arrangement by which their services are tendered to the same classes, except perhaps through dental colleges or departments which are necessarily accessible to but few.

Your committee suggests that this Congress recommend that through national, state and local dental associations arrangements be made whereby

1st. Dentists may place their services at the disposal of physicians or surgeons in charge of hospitals and other eleemosynary institutions, to the extent of consultations, treatment for relieving pain and removing causes which might complicate diseases or retard cure, and also for preventing by temporary fillings or otherwise imminent pain or loss to the patient.

2d. That through the arrangement for ways and means, independent and apart from those over which physicians and surgeons have the charge, whereby relief and prevention, together with instruction in practical hygiene of the teeth, may be the object, and the means for care of the teeth provided.

3d. That by examination, tabulation and publication of the condition of children's teeth in schools and other public institutions in order that their managers and the public generally may better apprehend the needs in the care of children's teeth.

Much has been done by the British Dental Association in examining and tabulating the condition of the teeth of school children in Great Britain. Dr. Cunningham and Mr. Fisher, of England, and also Dr. Ottofy, of Chicago, have done much in furtherance of this work, but rather for scientific purposes.

A free discussion of the subject of this report will doubtless be productive of much good, and it is invited.

Respectfully submitted,

W. J. BARTON,
Acting *Chairman.*

Digitized by Google

REPORT OF COMMITTEE NO. 20, TO PROMOTE THE APPOINTMENT OF DENTISTS IN THE ARMIES AND NAVIES OF THE WORLD.

Mr. President and Gentlemen:

The committee to promote the appointment of dental surgeons in the armies and navies of the world beg to report:

The opposition to such appointments was from the surgeons in the army and navy of the United States. The proposition of giving the dental surgeon an equal grade with the surgeon met with the strongest opposition.

It was deemed the better course not to be too urgent at this time, but to send every year a copy of this request to the Surgeon-General, to remind him, that the efforts to place the dental surgeon on an equal grade with the surgeon had not been abandoned. Respectfully,

M. W. FOSTER,
Chairman.

A communication on the dental uses of cocaine, by Dr. G. Viau, of Paris, France, was referred to Section IV.

The President announced as a topic for discussion the following: "What Relation shall Dentistry hold to Medicine," and Dr. J. D. Patterson, of Kansas City, Missouri, President of the American Dental Association, was invited to open the discussion.

DR. PATTERSON. While I have noticed with care the discussions upon this subject, which have been very frequent in the past years, I have engaged in them but little, because I did not deem that the cause of dentistry would be hastened by many of the discussions which have been held. I believe in the dental profession going along in the way it has in the past; and while I believe that dentistry is a specialty in medicine, yet from my experience in connection with dental sections in medical associations our most rapid progress has been as an independent profession, not for one moment detracting from the fact that ours is a specialty in medicine.

Digitized by Google

It seems to me from careful observation that our greatest advancement has always been when we have acted as an independent profession. Whatever may be the outcome of the consideration of this subject in the future, it seems to me that we advance more rapidly where we work independently of medical associations and dental sections in connection therewith. That is my experience.

I am sorry that I have not given this subject more attention; it is one in which I have strong opinions, and while I have worked with all the enthusiasm that I have for medical men and for dental sections in medical associations, and given them all the encouragement I have in my power to give, yet I believe, as I have previously said, that our most rapid progress has been and will be in the future if we still hold to our own independent organization.

DR. J. Y. CRAWFORD, of Nashville, Tennessee. The question is propounded, "What relation shall dentistry hold to medicine?" I would prefer to discuss the question, What relation does it hold to medicine? The fiat has gone forth, the question has been adjudicated, settled for all time, so far as that is concerned. That it is a part of the grand old healing art, there can be no question. If the question as formulated means the attitude the dental profession shall sustain in relation to the medical profession, in scientific and practical work, in furthering the interests of humanity as embraced in the healing art, then I should think it appropriate. I do not know whether I caught the purport of Dr. Patterson's remarks upon this question. I am inclined to think that he intimated that perhaps the work in medical organizations had not been as efficient and as productive of good as it might have been. It is my candid opinion that the most good that could be accomplished by associated work would be by having in every medical organization in this country, local, state, national and international, well-equipped sections on dental and oral surgery, and by bringing together those who are earnestly working for the advancement of the healing art in general and men who are capable from a dental stand-

Digitized by Google

point of impressing upon the medical profession the importance of dental surgery. It is well recognized that dentistry is a hygienic procedure, the influence of which humanity has never yet been the recipient to the extent that it ought to be. If it be hygienic science, it is entitled to the highest consideration with both the medical and scientific world? Why? Because the question of preventing disease is paramount to all other questions of a medical character. I want to say in connection with the subject, and to put myself on record with regard to the importance of dental surgery, that I believe the responsibility devolving upon the dentists of the world and the perpetuation of this civilization depend largely upon the recognition of the potency of the art and science of dentistry. All other distinctive civilizations past have gone to ruin, and none of them, so far as my humble opinion goes, has ever utilized the art of dentistry from a hygienic standpoint. In order that the generations yet unborn may be benefited by its hallowed influence, it should be given the recognition that it is entitled to. I will relate an instance that was reported to me by a gentleman prominent in our ranks a short time ago. He described an extensive injury inflicted to the human face, and the surgeon having it in charge appealed to the dental profession of his city. Out of the number he could not get any dental surgeon that would assume the responsibility of the treatment entirely, until he came to this gentleman. They declined. Why? Because they had never come in contact with such an injury of the human face in a practical way, and held up their hands, and said they were not competent to perform the duty. In all cases of injury to the face and oral cavity, the dental surgeon ought to have supreme and complete control, and he never will get that until we obtain that full and unquestionable recognition from the entire medical world that we are entitled to. As was said by a distinguished gentleman last year, it is time that the dental world should make some return, by scientific contributions, for the magnificent literature furnished by Hunter and Galen, and other leading characters in the medical world.

Digitized by Google

DR. F. F. FLETCHER, of St. Louis, Missouri. Many of the best dental schools are connected with medical colleges, and dental students go there, listen to medical lectures, and get what dentistry they can pick up during the course. The point I wish to make is this, that dentistry should be taught and learned in institutions as a specialty, and conducted for that alone, as attending the lectures and instructions in a medical college do not afford the proper opportunities, the medical students receiving first consideration. By so doing I think we will have better men, more self-respect and more independence. Our students will feel that they are in a college that is their own.

The report of the Committee on Prize Essays was then read by the Secretary-General, awarding to Dr. George Cunningham, of Cambridge, England, the prize for the best essay on Oral Hygiene, and recommending that the medal be awarded to him.

REPORT OF COMMITTEE NO. 23, ON PRIZE ESSAYS.

Mr. President and Gentlemen:

The committee respectfully report the paper of Dr. Geo. Cunningham, of Cambridge, England, as being the best essay presented on the subject of "Oral Hygiene," and recommend that the medal be awarded to him.

THEODORE STANLEY,
Chairman.

THE PRESIDENT. No introduction is necessary in this Congress after one week of the presence and active interest of Dr. Cunningham in this convention. He has been here with us, and is known to each one as an active, progressive and scientific worker for dentistry. Oral Hygiene was selected by the Executive Committee as the one subject for which a prize should be offered for the best essay. Among the many essays that have been submitted for this prize, the committee has decided on the one that has been read to you by the Secretary-General.

Digitized by Google

If you remember, on Monday, while a multitude of subjects of great interest were omitted by the President from his address, he could not totally exclude the subject of Oral Hygiene as one of the very important subjects in our specialty, lying at the foundation of all health and of all success in operative work.

It gives me especial pleasure at this time, as the presiding officer of this Congress, and as former professor of Dr. Cunningham, to invest him with this token of his intellectual ability and scientific evidence. I pin the medal on the lapel of his coat with very great pleasure, and trust that wherever he goes to a dental meeting he will wear it with pride, as the successful result of one of the special efforts which he has made among the many works which he has done for dental progress. The medal is appropriately engraved for him. [Applause.]

Dr. Cunningham was called for.

THE PRESIDENT. It was not expected that Dr. Cunningham would make any reply at this time, but if he wishes to do so he has the privilege.

DR. CUNNINGHAM. *Mr. President, Ladies and Gentlemen:* First of all, I need not tell you how much I appreciate the honor you have bestowed upon me for being successful in gaining the prize for my essay on Oral Hygiene. Part of the essay is based on original research, if I may be allowed to say it. I have been fortunate, however, in having the co-operation of my colleagues in Great Britain in what I consider the most important feature of our professional work, and that is in endeavoring to bring our remedial and preventive measures within the reach of every one. We have taken up the cause of the poor children; it is no good talking to the adults, as their case is almost hopeless. I think I have demonstrated beyond doubt in my essay, by carefully compiled statistics and the results of examinations of 10,000 mouths of school children, that medical science is not complete unless it gives those children dental attendance. I

Digitized by Google

look upon the teeth of the children of our country as so much national capital. The poorer they are the more they need our services.

THE PRESIDENT. The next order of business will be remarks from representatives of foreign countries.

M. Chas. Godon, of Paris, then read the following resolution:

CHICAGO, Aôut, 1893.

Monsieur le Prèsident, Messieurs les Membres du "World's Columbian Dental Congress:"

Les soussignés délégués étrangers, considérant le succès obtenu par le "World's Columbian Dental Congress," comme prouvent le grand nombre de ses membres et l'importance de ses travaux, désirent assurer dans l'avenir la réunion de semblables Congrès et ils ont l'honneur de proposer l'adoption des résolutions suivantes:

1. Le Congrès considère que dans des circonstances semblables á celles qui ont amené la réunion des Congrès de Paris en 1889, et de Chicago en 1893, il ne pourra qu'être avantageux pour la profession de provoquer la réunion des Congrès Dentaires Internationaux.

2. Il laisse aux sociétés odontologiques adhérentes le soin de déterminer pour leurs pays respectifs le lieu et l'époque des prochains Congrès Dentaires Internationaux.

[German translation.]

Herr Präsident und meine Herrn vom "World's Columbian Dental Congress:"

Ermuntert durch den zahlreichen Besuch sowohl als durch die ausserordentliche Anzahl gediegener wissenschaftlicher Arbeiten, beehren sich die unterzeichneten ausländischen Delegaten, in der Absicht, fernere internationale Zusammenkünfte anzubahnen, folgende Beschlüsse zu unterbreiten:

Beschlossen: Diese Versammlung ist der Ansicht, dass

Digitized by Google

es unter gleichen Anlässen, welche unsere Berufsgenossen im Jahre 1893 in Paris, sowie auch jetzt hier zusammenführten, empfohlen sei, in der Zukunft ähnliche Congresse zu veranstalten, um den unverkennbar guten Einfluss auf unseren Beruf noch mehr zu heben und zu fördern.

Ferner sei es beschlossen, dass es den ausländischen zahnärztlichen Vereinen überlassen bleibt, den Ort sowohl als auch die Zeit, in welcher solcher Congress stattfinden soll, zu bestimmen.

[Spanish translation.]

Señor Presidente y Miembros del Congreso Universal Columbino de Dentistas:

Los infrascritos delegados extranjeros, considerando el éxito que ha tenido el Congreso Universal Columbino de Dentistas, como se demuestra por el número de sus miembros y por la importancia de sus conclusiones, deseando asegurar para el suturo la reunion de congresos semejantes, tienen el honor de presentar la siguiente resolucion:

1. Este Congreso considera, que en circumstancias análogas á las que condujeron al Congreso de Paris en 1889, y al Congreso Universal Columbino de Dentistas en Chicago en 1893, no podria ser sinó muy ventajoso á la profesion, el tener Congresos Internacionales de Dentistas en lo futuro.
2. Que se delegue á las sociedades extranjeras de Dentistas determinar por sus paises respectivos, el tiempo y lugar para la reunión de esos Congresos Internacionales de Dentistas.

[English translation.]

Mr. President and Members of the World's Columbian Dental Congress:

The undersigned foreign delegates, considering the success achieved by the World's Columbian Dental Congress, as proved by the number of its members, and by the importance of its accomplishments, desiring to assure for the future the reunion of similar congresses, have the honor to present the following resolution:

Digitized by Google

This Congress considers: 1. That, under similar circumstances to those which led to the Congress of Paris in 1889 and the World's Columbian Dental Congress of Chicago in 1893, it could not be otherwise than advantageous to the profession to have similar International Dental Congresses in the future. 2. That it should be delegated to the foreign dental societies to determine for their respective countries, the time and place for the meeting of such future International Dental Congresses.

(Signed)

CHAS. GODON, France.
A. RONNET, France.
O. BARRIÉ, France.
GEO. CUNNINGHAM, England.
EMIL SCHREIER, Austria.
R. H. PORTUONDO, Spain.
J. DE OTAOLA, Spain.
EUSTAQUIO CALVO, Spain.
DAMIANO MELA, Italy.
SOLARY ANTONIO, Italy.
E. A. LUNDY, Hawaii.
M. BASTYR, Austria.
G. VARGAS PAREDES, Rep. de Colombia.
ANTONIO VERGEL DE DIOS, Philippine Islands.
FLORESTAN AGUILAR, Spain.
H. E. HIGHLANDS, Spain.
ERICH RICHTER, Germany.
J. E. GREVERS, Holland.
ALBERT H. CHAMBERLAIN, Italy.
G. O. WHITTAKER, England.
ANDREW ROSE, Canada.
CHAS. RATHBUN, England.
W. MITCHELL, England.
E. KRUGER, Germany.
E. F. C. GOERITZ, Germany.
GUSTAV SCHNORR, Germany.
J. S. BURNETT, Uruguay.
FRIED. PANKOW, Germany.
H. B. SMITH, Bermuda.
R. H. ROBERTSON, Canada.
D. CARACATSANIS, Greece.
C. P. LENNOX, Canada.
T. J. JONES, British Columbia.
L. C. BRYAN, Switzerland.
J. C. BIRCH, England.
E. C. CLARKE, North Wales.
S. LIMBECK, Russia.
G. KOROBOSHEWSKY, Russia.
E. JESSEN, Germany.
F. KRILLE, Germany.
J. L. SECHER, Denmark.
W. S. DAVENPORT, France.
J. F. PATTERSON, Switzerland.
E. M. FLAGG, Paraguay.
FRED. TANZER, Austria.
W. M. WINDER, Canada.
CEPHAS WHITNEY, Jamaica.
G. C. DABOLL, France.
ALFRED BURNE, New S. Wales.
FLORENCIA DE LA BARRERA, Cuba.
K. TAKAYAMA, Japan.

DR. CUNNINGHAM. I have been requested to second the resolution which has been proposed by M. Godon, and I think that most of us will admit that it is one of the practical ways in which we can express our gratification at the

Digitized by Google

marvelous success of this great Congress. [Applause.] We have enjoyed and appreciated it so much that we would like to have a similar congress in the future. In the resolution there is laid down a proposition as to how such a Congress may be organized, namely: it should be left to the National Dental Societies of the respective countries to do their best to initiate such a movement. As to whether the record made here can be beaten, it remains to be seen. We all admit that we have achieved a great record at this Congress, and one which will stand for a long time. In athletics there is a great deal in breaking a record. I think to-day the dentists of America, and especially those of Chicago and of the State of Illinois, must congratulate themselves upon the fact that they have beaten the record.

It is not advisable at this time to go into the details which have constituted the great features of this Congress. There are persons here who have been behind the scenes, and a great many of us have no conception of the amount of work that has been going on to make this Congress a success. Take, for instance, the remarkable feature, absolutely unique in the history of the profession, of the daily journals with which we have been supplied. These journals have been conducted by an able staff of editors and reporters. Then again, we have had other featurers in the shape of receptions and hospitality, and more especially the banquet, and for which we are largely indebted to the untiring efforts of Dr. Gardiner and others. There are other gentlemen, too numerous to mention, who have done good work in connection with the Congress.

On behalf of the English representation, I desire to say that we appreciate highly the pleasure we have had of assisting in person and making one of the brightest and most lasting pages of dental history. It is great satisfaction to have taken part in the biggest associated effort that has ever been made by the dental profession. [Applause.] It is the result of the breaking down of local and national barriers, uniting us in a common brotherhood. I was asked why I was not in the procession with the British boys to-

Digitized by Google

day, and I replied that I considered it my duty to be here with you, rather than to assist in the demonstration. [Loud applause.]

The resolutions were unanimously adopted.

Dr. Florestan Aguilar, of Cadiz, Spain, presented the following:

On behalf of the foreign delegates, I move you, sir, that a vote of thanks be extended to the President, Secretary-General and other officers, the Executive Committee and other committees of the World's Columbian Dental Congress, the Columbia Dental Club, and to the profession of Chicago and the United States, for courtesies extended to us, and for the hospitable manner in which we have been entertained during our stay in Chicago.

Seconded and unanimously carried.

The following communication was read:

The women members of the Dental Congress desire to tender their most grateful thanks to the President, Dr. L. D. Shepard, and the Secretary-General, Dr. A. W. Harlan, for the cordial reception extended to them both professionally and socially.

HATTIE E. LAWRENCE,
Chairman Woman's Committee.

Seconded and unanimously carried.

At this juncture Dr. John S. Marshall, of Chicago, Treasurer of the Congress, announced that there had registered 115 foreign and 990 American members, making a total of 1,105 to date.

The Secretary-General then announced the following books and pamphlets as having been presented to the Congress:

Digitized by Google

Des Resultats Eloignés
de la
Prothèse Immédiate
dans les Résections
du Maxillaire Inférieur
par
le Dr. Claude Martin,

Médecin-Dentiste de l'Ecole du service de Santé militaire, Lauréat de l'Institut, Lauréat de l'Académie et de la Faculté de Paris, de la Société nationale de Médecine de Lyon (medaille d'or), Membre de la Société nationale de Médecine de Lyon, Officier d'Académie.

Aussi:

De la
Prothése Immédiate
Appliquée a la
Résection des Maxillaires,
Rhinoplastie
sur appareil prothétique permanent
Restauration de la face,
Lévres, nez, langue, voute et voite
du palais
par le même auteur, avec une
Preface de M. Professeur Ollier,
Membre Correspondant de l'Institut,
230 Figures dans le texte,
Ouvrage coronué par l'Institute.

Code du Chirurgien-Dentiste Explication de la loi du 30 Novembre, 1892, sur l'exercise de la médicine en ci que concerne exclusivement les Chirurgiens-Dentistes.

par

Emile Roger, Avocat à la Cour de Paris, Professeur de droit Médical a l'Ecole dentaire de Paris.	Charles Godon, Chirurgien-Dentiste, Ex-Directeur adjoint de l'Ecole dentaire de Paris. Officier d'Académie.

Digitized by Google

Die
Orthopedische Behandlung
der
Sattelnase
mittelst von der Zahnheilkunde gebotenen Hülfsmitteln.
Verfasst und mit 82 Figuren versehen
von
Matti Äyräpää.

Satulanenän
Orthopedisesta Parantanusesta
Odontologian Tarjoomilla Apukeinoilla
Kiyoittanut ja 76 kuvalla varustanut.
Matti Ayräpää.

Contribution a L'étude
de
La Pathologie
du
Système Dentaire.
Par M. Eugène Legret.

Instructions et Questionnaire
pour
L'étude du Systeme Dentaire
Chez Les Differents Peuples
approuvé par la Sociéte d'Odontologiè de Paris Seance du
2 Decembre, 1890,
Par
M. P. Dubois.

Atlas
zur
Pathologie der Zähne
von
Prof. Dr. Heider und Prof. Dr. C. Wedl
Zweite vermehrte Auflage
Bearbeitet von
Dr. J. v. Metnitz.

Digitized by Google

The next in order were closing remarks by the Chairman of the Executive Committee, but in his absence Dr. J. Taft, of Cincinnati, was called upon to address the Congress as the representative of the Executive Committee.

DR. TAFT. The work done by the Executive Committee since its appointment two years ago and more has entailed anxiety and great labor. Under the most favorable circumstances there would be anxiety in the minds of those who have such a work in charge; but there were adverse circumstances to overcome, some imaginary, perhaps, but others real, some which threatened greater obstacles than were found. In the main these have all cleared away, and we have a grand and undisputed success and a far greater attendance than was anticipated. There have been some things within the last month that contra-indicated success, but even the financial disturbance and troubles that have swept over our country have not been sufficient to obviate the grand success which has been achieved. It was thought that from 500 to 800 members was all that could reasonably be expected, in view of the financial troubles, but there were about 1200 members present. We are gratified that a large number are here from other countries. I think I voice the feelings and the sentiments of every one of my own countrymen in this matter when I say that it is a source of great satisfaction and gratification that we have been permitted to welcome so large a number of our professional brethren from across the water.

What will be the outcome of this great work? I look upon it as prophetic of the great interest and rapid progress of our profession. It would be a difficult thing to attempt to give prophetic utterance in regard to the progress of the profession in the future. Who would have attempted fifty, or twenty-five years ago, to have prophesied such advancement and progress as has been made in the profession during this period? What can we anticipate for the future? We dare not predict, but we are justified in saying that there will be an upward and a forward movement, and a richer

Digitized by Google

development than has been realized. New things will arise, perhaps, in the near future. Let us work on. Let this be a stimulus for us to go forward and do more and more. The door of opportunity is open wider to-day than it has ever been, and we should enter and occupy to the fullest extent.

Our sisters, our lady friends, have had a door opened to them through which they have entered into this profession. Is this not indicative of onward movement? People sometimes criticize the entrance of women into this profession, just as they cavilled and criticized when women entered the medical profession years ago. I believe that the women of the profession will do work that men have not done. They will look more to the hygienic aspect of the profession, they will accomplish more, they will have more sympathy for the children, and they will look more to the oral diseases of children, more to the prophylactic and hygienic efforts that may be made for the rescue and preservation of the little ones from attacks of disease.

Ladies and gentlemen, when we look at what has been done here, when we remember the fact that a larger number has been present, and a greater effort has been made during this week in behalf of dental science than on any other occasion, what shall we say for the future? If another Congress seems proper, let us have it. If other associated work seems to indicate great results within our grasp, let us do all we can towards this end. The profession is able and capable of doing a great work, and it may be that a greater work than this will be accomplished in the future. [Applause.]

The Secretary-General then announced that the Executive Committee of the Congress had appointed Dr. E. M. S. Fernandez, of Chicago, as the Spanish Secretary.

CLOSING REMARKS OF THE PRESIDENT TO THE CONGRESS.

Ladies and Gentlemen: I am sorry I have not had time to fitly prepare my closing remarks. This body has such intelligence that no extemporaneous remarks should be per-

Digitized by Google

mitted from one occupying the chair, except under extraordinary circumstances.

The origin of this Congress was unique. It did not proceed from an individual meeting of dentists, but from recognized authority—the highest that we have in this country. The scheme was to bring together, not a mass meeting of dentists, but a body of educated men who stood well in the profession and in the community. Provision was made for membership which should answer this requirement, that the American members of the Congress should be known as ethical and legal practitioners, and that none should be received from foreign countries unless they had received from the officers appointed for that purpose their approbation, testifying to their proper conduct as regards their practice at home. In carrying this out, it became necessary to appoint many committees, and I will very briefly refer to these committees.

The Programme Committee has, as you all know, had arduous labors to perform on extremely short notice. The arrangement of the papers day by day has involved a great deal of work which has not been seen in the meetings, and can only be realized by those who have done a similar work.

The Committee on Exhibits have, as those who have witnessed them know, performed their work with great thoroughness, and have presented, as I am informed, an excellent exhibit.

The Committee on Reception I need not enlarge upon. You know that it has been efficient, and I desire to say in its behalf that the financial question has affected it in the discharge of its duties more than that of any other committee. We have seen a state of things in this country which has hardly had a parallel. Many letters have been received from those intending to come, saying that they were kept at home from inability to get the money with which to come. This affected the Reception Committee, as it has all other departments of the Congress, but especially that committee. Those who were present last evening in the banquet hall of the Chicago Beach Hotel, where so many countries were rep-

Digitized by Google

resented and a number of languages spoken, will need no encomium from me of the efficacy of that committee, and its members have done all they could with the means at their command.

The Committee on Registration has had great work to do and has done it efficiently.

The Committee on Membership was designed as a last resort to investigate the ethical standing of those applying for membership. The position required judgment of a judicial kind, and courage to act in accordance with the conviction in needed cases. I desire to say that notwithstanding the repeated publication of the conditions of membership, the action of that committee has been needed to bring this Congress in harmony with its high ideal, that there should be no one a member of it who is not a respectable practitioner in an ethical sense.

The Committee on the History of Dental Legislation in this and other Countries has made a good report. Through some misinformation, this report has not come before you for action and discussion, as it was referred to the Section on Legislation. The report was a fine one, and will be published in the Transactions of the Congress.

The Committee on Educational and Literary Exhibits decided that it was impossible to carry out the idea. Sufficient space could not be obtained for the display which the committee had prepared for and was ready to make. The authorities at the Fair could not grant the space required, and it was decided by the chairman of that committee that it were better not to hold an exhibit than so to be cramped as to space as to be obliged to make a poorer exhibit than the materials within his command afforded him.

I need say but a word in regard to the Committees on Clinics in Operative Dentistry, Oral Surgery and Prosthetic Dentistry. Personally, I am sorry to say that I have not been able to see their work, but from the accounts that I have received I know that their arduous and trying labors have been well performed. The clinic rooms have been crowded; many new and useful appliances and inventions

Digitized by Google

have been shown and demonstrated, and much good educational advance has come from these exhibits.

If there is one man in this Congress who is perhaps more nearly omnipresent than any other man it is the cheerful and hard-working chairman of the Local Committee of Arrangements, Dr. Frank H. Gardiner. [Applause.] There are many of us who have received his aid, and who wish through me to thus publicly express their indebtedness to him.

The Committee on Essays has been at work a long time, and has done valuable and efficient work, as has been demonstrated by the daily programme. It was their province to look over the world and select the essayists, solicit papers and present here those they judged worthy.

The Committee on Conference with State and Local Societies and the Committee on the History of Dentistry in the United States have worked in harmony, under the efficient chairmanship in each committee of Dr. Taft. You heard an abstract read of the investigations and material secured by these committees, and a full report will be interesting to all Americans.

The Committee on Nomenclature has had much work to do and has done it well. The chairman, Dr. Black, has been untiring in his devotion to the work of that committee, and has produced results which we trust will be taken up by other bodies which have a continued existence, and be the foundation for some uniform system for the use of the world.

The Committee on the Care of the Teeth of the Poor has presented its report. The subject is a very important one, and it would have been well if it could have come before the meeting for discussion.

The Committee on Biology and Bacteriology, Dr. Andrews, chairman, has also done excellent work, and in a line which is scientific, fundamental, and without which, as I said in my address, all progress would be a failure.

There have been many other committees and their work has been well done. I will not refer to the Executive Committee, except to say that it has accepted the trust and has

Digitized by Google

endeavored to carry it out to the best of its ability. The contributions of this committee in actual loss of time and expenditure of money for traveling to Washington, Chattanooga, Chicago, and other places for the meetings of the committee during the past three years would aggregate a large sum, which they have contributed to the success of the Congress. [Applause.]

I think, then, it may be truly said that the work done in this Congress has been most satisfactory. Usually, when there are side shows or outside attractions, people are taken away from the dry and less exciting work of professional meetings: but notwithstanding the marvelous attraction so near us, the meetings in this hall have been well attended, the clinic rooms have been thronged, and the section rooms have been crowded. Hour after hour the members of the Congress have tarried to discuss the papers which have been presented. I think under the circumstances of the extraordinary counter-attractions the attendance of so large a number of members at the sessions deserves special mention as showing their devotion to the profession, and that they came here for dentistry first, and have attended to it while they were here. The very wise and thoughtful provision made for carrying on the work by those in charge is the cause of the success of this Congress.

While no one could be more appreciative of the honor which this position brings with it, there is also the consciousness that there are many other American dentists who have done infinitely more for the advancement of the profession in this country and the world. We have members who are known throughout the world as original, scientific investigators, and their names will live in history, not as presiding officers, but as workers in the fundamental fields of research which make true progress. The President is in this Congress but a figure-head for the expediting of the transaction of the business which had been planned by others and laid out beforehand, and he desires personally to thank every member for the kindness which he has received at their hands.

Digitized by Google

The friendships which have been made here will last through life. We have met and made friends with the eminent men of the profession from almost every clime, and friendship, the result of personal meeting and personal converse, is an immense factor in progress. For the kind resolutions which were presented in behalf of the foreign members of the Congress, we return our thanks, and rejoice that those who have come from afar have enjoyed themselves, and can tell us that while the record has been passed of the biggest meeting, the more valuable record of the largest work for progress is also observed. We appreciate very kindly the words of our foreign friends, and trust as they go hence to their homes success will attend them, and as the American dentist, who is a great traveler, shall visit their homes, we know that the warmest kind of welcome will await him at their hands. [Loud applause.]

Gentlemen from abroad, we are glad you came. We have enjoyed your company, and the bright thoughts, and the valuable instructions which you have brought to add to what has been gathered from our own shores, and we heartily endorse the movement that in future an exigency like the present shall be the foundation and the motive for the formation of another World's Dental Congress.

There is nothing now for me to do but, by the authority conferred on me, to declare this World's Columbian Dental Congress adjourned *sine die*. [Loud applause.]

Digitized by Google

Digitized by Google

SCIENCE—DEPARTMENT A.

SECTION I.

ANATOMY AND HISTOLOGY.

Chairman, R. R. ANDREWS, A.M., D.D.S., Cambridge, Mass.
Vice-Chairman, E. P. BEADLES, D.D.S., Danville, Va.
Secretary, F. T. BREENE, D.D.S., Iowa City, Iowa.

OPENING SESSION.

The Section met Tuesday, August 15th, at 2:30 P. M.

The Chairman, Dr. R. R. Andrews, delivered the following

ADDRESS.

It has been deemed proper by the authorities of this Congress to honor me with the chairmanship of this, your Section. I wish here to thank them for their confidence and good-will, and to ask your indulgence for any short comings that may be caused by my inexperience. It is an especial honor and privilege to greet you to-day in the name of the great interest of dental progress, of which, as a part of the Congress now in session, we have heard so much in praise in our President's address. We are met in the midst of unusual surroundings. Yonder is the beautiful White City, where the world has measured its genius with every age and every land of material progress; it lays with pride its laurels of victory upon the brow of our illustrious century. It is

Digitized by Google

there we may observe that in every department of intellectual and mechanical achievement, no honors are so great as those that are justly awarded to men who think. Thoughtful and intelligent workmanship is, in every grade of labor, the only price a true success can pay for the benefits of a real and solid progress. Quick returns to an indifferent and sordid practice can never build up a substantial profession, nor win for itself the recognition of truly cultured men. Dentistry has, in these last few years, held to a straight and stringent rule of ethics, declaring deep principles of professional practice, and holding forth to every practitioner a standard of high attainment. As a profession, we should not be content to have private enterprise found and establish schools of dentistry; such private enterprises should, in the future, be made to yield to a more central plan of professional education. The dentist should be no product of narrow methods hurried along some line of individual practice into the ranks of a calling which has no limitation of government, no recognized central authority. Our schools must be the schools of the dental profession, superintended by that profession, and its diplomas given in its name and by its authority. The high standard which we should exact from every dental graduate would in time exert an influence on our future scholarship and skill in workmanship, which would entitle us to the place we would fill among the professions. In my judgment, dentistry should not be one of the fugitive and obscure callings, irresponsible and independent; it should seek to fill an honorable place in the ranks of the great medical fraternity, where I believe it justly belongs. Our place is, and ought to be, among the specialties of the great guild of physicians. The oculist, the aurist, and the dentist should stand side by side, part of the great body of scientific workers who heal the sick. And to this end we must bring all the intelligent influence we can exert to place our noble profession on a splendid equality with "the best among the noblest."

And have we not offered much already as our contribution to the development of the sciences of medical prac-

Digitized by Google

tice? Our histological and pathological literature, our mechanical inventions, our ever-increasing discoveries with chemistry and the microscope, all show with what far-seeing study and native originality our students apply themselves and claim their places among the scientific explorers and molders of scientific thought.

We are not here merely as idle spectators of what the world has sent from its busy industries of brain and muscle, but we are here in the name of our profession to join our contribution to theirs in this world-wide exhibit of results. Are the members of any profession more honored to-day in the world of science than many of our own? May we not be justly proud of the scientific work of Tomes, of Magitôt, and Miller? And the list does not end here. There are many others who have given the best thought and work of their lives for the elevation of the profession they have loved so well.

In closing, gentlemen, I must remind you that we have with us to-day distinguished representatives from abroad. In the fraternal bond which unites us in a common service, we fear no rival jealousies or factitious criticisms. Dentistry belongs to no one nation; it belongs to the whole world, and we invite with sincere acceptance the competition of professional thought from every quarter. We greet you, gentlemen, with true American hospitality, and bespeak for you from each of the representatives of our national and state organizations the cordial welcome of a friend.

And now I have done. Let us have a free and open arena for discussion; let fraternity and good-will dominate our council, and we shall mark the work of our Section of this Congress of 1893 as one of the most productive of good results we have ever held.

Let us now proceed to the business of the hour.

The following paper was read:

Digitized by Google

WHAT HAS DENTISTRY TO DEMONSTRATE AGAINST THE HYPOTHESIS OF ORGANIC EVOLUTION?

By W. G. A. Bonwill, D.D.S., Philadelphia, Pa.

In citizenship every man is considered to be free and equal; why not in science?

Is it presuming to ask you to hear what a dentist has to offer after evolution has permeated every shade of thought and work, and some of the best minds have become imbued so far as to quite affirm that it is no longer an hypothesis but a stable truth?

As a free thinker and worker in dentistry and cognate science, I believe I have some little right to be heard for what forty years of research and demonstrative work has placed before the world, and I have, what seems to me, truth for a basis, and which demands of my brethren and the scientific world an answer, or at least some reply. A respectful hearing should be granted; and, whether there is any truth or foundation for my argument, no one has a right in advance to assert that it is all the fallacy of a crank.

That what will be brought before you to-day is absolutely new, goes without the saying. The grounds taken could not have been on a mere conjecture or a preconceived theory, simply to have something to say. It is none the less unworthy because so much has already been written to disprove the hypothesis which still withstands attack.

A member of your profession has dared to reveal what remains for you to prove fallacious, not by argument but by mathematical calculations and mechanical precision. You cannot set it aside by ridicule or by saying that "bigger men than you have tried to stem this tide." You must meet the figures, gentlemen, and the demonstration and practical workings of what is now brought forth after so many years of exact manipulation.

It is not expected by its discoverer that he will convince any one of you by his descriptive charts and works. He is aware that it takes more than pen and paper, but he asks you to stand beside him and watch every step he takes while

Digitized by Google

grinding on a full set of teeth. See if the chart or mechanical drawing is followed to the very letter and line, and what is the outgrowth of the geometrical and mechanical laws involved therein. Follow him in this and he asks no greater compliment, for he knows "none but the fool says there is no God." You will see His workings here to absolute perfection, and poor, finite man will be able to discern in this the simplicity of all organisms.

Please remember this is no finely spun theory, but as pure a law as was ever before revealed to man, and must have a hearing. It should give dentists the greater pleasure to know it is from not only the laws governing the making and creating of the human teeth, but it springs from his profession, with a probable chance that there is a shadow of truth in what this man has to reveal.

Then follow him to the end and not prejudge what you know nothing about even in its application to dentistry, let alone this problem around which there is no shadow of truth to the really scientific mind.

What is the discovery and argument with its absolute demonstration?

In August, 1889, there appeared in *Lippincott's Magazine* an article, by me, simply setting forth in synopsis the points claimed for the laws and their application, only briefly hinting at the texts upon which, later, I would take them up.

No argument was made and there was asked that a respectable time be given to complete the book to follow. Many of you saw the article. Some dared to reply. It was presumption to do so since the author had not been heard in full. He has made no haste to answer the critics. He could afford to wait as did Kepler when he formulated the three (3) laws of motion. Kepler knew he would probably die ere the scientific world would corroborate the discovery revealed to him, and in philosophical strain, knowing how truth before had been crushed to earth, he said, "God has waited 6,000 years to reveal this to me, I can afford to wait a century to have others receive it." He further said, "And now, O God, I think thy thoughts as Thou didst before me."

Digitized by Google

The revelation you will see to-day came as did those laws to Kepler, and if not received at once, will not abash him to whom this work, before unknown, has had its showing in and through him.

Unless you can grant that there is such a thing *as an absolute or ultimate principle* upon which all science is built, then it were useless to continue my work. None of you can deny that mathematics, mechanics, chemistry and astronomy are founded on absolute laws, and from which there is no variation or chance for evolving.

Then if these are so founded, why not the discovery herein revealed, which is but the child of true science. No one yet has denied that geometry is an ultimate. You see it start from "a point to a line, the shortest distance between two points," until every conceivable angle and curve, and the figures with their creations in mechanics and calculations of the universe of worlds and their past, present and future movements. No mistake has ever been made by the working of these laws, which came before worlds and organizations. Then why should you deem it impossible for a private dentist to show up how it has worked in the consummation of everything that has shape and action? Give us a chance, then you may say what you please.

You will be confined to actual facts and figures, and the models and the history will be given in the future work soon to be published.

Claim 1.—That the human jaw and teeth show, beyond doubt, the workings of absolute laws which gave them the highest efficiency and from which organization there could be no change except retrogressive, not progressive; not to a higher form.

Claim 2.—The human jaw is based for its organization and workings upon the principles of the equilateral triangle, which, as well, underlie the shape of every tooth and the numbers to occupy that equilateral space.

Claim 3.—Given the length of one arm of this triangle, say four (4) inches, and it can be shown from this alone how, whatever or whoever made the first human jaw, that

Digitized by Google

with a pair of dividers and a straight edge the size, shape and number of each tooth in both upper and lower jaws and their absolute places therein were made; and further what should be the exact arch containing the six incisors in both jaws and the action in mastication and incising of food.

Claim 4.—That the human jaw is no exception to this rule. That the proportions of the human body are founded on the equilateral triangle and unless so, no fitter organization could have ever existed or been brought into being nor could it ever have been reached unless by the same rule at the very beginning of its existence.

Claim 5.—That if the hexagon cell of the honey bee, which cell existed before man, is incapable of change to make it fitter for the object for which it was designed, then we can claim it as a precedent that the same principle in the human jaw is none the less true and demonstrable.

Claim 6.—I claim not only to have discovered the laws by which organizations are made, but have perfected the drawings from these laws by which any skilled artisan or mechanic can reproduce and duplicate, artificially, what the working model here presented demonstrates and its action shows beyond doubt the highest efficiency in such an arrangement, based simply on the principle of the equilateral triangle.

Claim 7.—If the human mind cannot conceive of a fitter organization than what is here demonstrated, and produce it from the laws and principles of evolution, then there can be no progression to a higher state that can form a basis of argument for the evolutionist.

Claim 8.—That if no one can show any fraud in this work and the claim of "an ultimatum having been reached" by a human being, it must follow that nature, who had the first chance at the building of organizations must have done her best and made the very fittest in the beginning.

Claim 9.—It is claimed that natural selection could only have reproduced a pre-existing organ or organism or previous type and could add no new organ or alter the form of the pre-existing one to higher efficiency.

Digitized by Google

Claim 10.—That mechanical means, which can only be externally applied, cannot even reproduce an existing type, let alone form an additional organ or organism.

Claim 11.—There is no proof that when any organ has once been lost that it has ever been reproduced in the same animal; in the progeny, the same organ will again appear, but nature will patch up in order to prolong life, but never in one lifetime make the effort to ever reproduce the lost organ, or lay the foundation in the offspring to make an additional organ either like the original or make one of a higher efficiency.

Claim 12.—The human jaw (to the glory of dentistry) furnishes one of the strongest or most absolute proofs of Claim 10 in the reproduction of the temporary set of teeth, which when completely lost at the age fifteen, again appear in the offspring when there was no such organism existing at the time of procreation to give birth to an entirely new temporary set in that offspring.

Claim 13.—The dental apparatus affords the best proof of the workings of a practical scientific workman from pre-existing laws and nothing but intelligence and a personality could have ever conceived and made such organs and organisms, and no further proof is needed of the purely scientific productions given in this discovery.

To those who have been ready to ridicule this idea let them look into the histories of the work of the Egyptians, their pyramids, temples and monuments. Their calculations were largely based on this equilateral triangle, and led to their works being so perfect that in the obelisk alone, not a line has ever been changed to make it more perfect.

Polyclitus, an artist 500 years before Christ, saw that in the equilateral triangle, square and the circle, he had the laws and rules to show the perfect proportions of the human body. In all these years no change has been made in his directions; so say artists.

Plato placed this angle as the most important of all geometrical work; and as a purely scientific mind, he ignored all men as unscientific unless possessed of geometrical knowledge

Digitized by Google

as known at that age most perfectly. Come down to the present day and you will find in this angle a law that no mechanician or artist can afford to ignore.

See how the circle is divided into 360 degrees, and these again into the hexagon of 60 degrees upon which even the honey bee has founded its cell of equilateral triangles.

Its importance is as great as that of the circle, of which it is only a sixth, and is equally perfect because it fills space perfectly, and no more or less can be crowded into the lines given.

No development of the equilateral triangle can be made except to carry out the geometrical laws on which it is based and is the first practical shape given after the "point—to a straight line—the shortest distance between two points—to a circle."

It is the basal angle of all development of form. It is proven beyond doubt in the human jaws, their creation and perpetuation and preservation without change to a higher form of organization and must ever remain the basis of this complex organism, which cannot be changed to a higher type any more than its base can be.

From what I have here shown you in this specification or description of the working model of a perfectly reproduced dental organism, with the accompanying drawings and explanation of the laws or rules underlying the whole discovery, any one conversant with mechanical drawing can construct a perfect set of human teeth as to size and crown surfaces and their positions without ever having seen an original set, and can reproduce a working model of artificial teeth which in the mouth shall work perfectly as in nature. The same rule is followed as in geometry commencing from a point.

The average jaw measures about four inches from the centre of each condyloid process to the median line at the cutting edge between the inferior central incisors.

The measurement must be taken from the lower jaw as being the one of motion; the upper has to be made to conform to the special forms and measurements of the lower.

Digitized by Google

The centre of each condyle being the centre of motion, rotating on one condyle only, the other describing the arc of a circle by moving forward in the glenoid cavity, is the proper point from which to measure the angle. The examination made by me of 4,000 dead and at least 6,000 living jaws attest this assertion.

The average is four inches, and is as long as five in many cases of the Indian and Malay, as well as some in all nations.

The few cases where the angles do not hold true is among nations who compress the cranium. The human jaw left to its own normal development must always be an equilateral triangle, and it is shown most beautifully and completely in all embryos from the period of formation in the lower jaw. I will go so far as to state that, in the designing of the human jaw it was done by first making the lower; and the dividers, from the same standpoint, while developing the lower, when carried over the arch or outer boundary of the lower, shows the exact size of each upper and the distance they should be from the lower, in order that, in the lateral and forward movement of the lower, one-half of the teeth, or, from the median line to the last molar on one side only, should be in apposition for mastication and incising.

The proportions of the upper teeth to the lower are as exact as any of the measurements shown.

The size of the arch of the lower jaw must be just one-twelfth of the main circle drawn around the equilateral triangular jaw, or the teeth could not be made to fill the space. To fill the space to perfection in any such an angle it can only be done by throwing everything into an equilateral triangle. No other angles will do it.

The mean diameter of the fourteen lower teeth, in line, measures the same as one line of the equilateral; when these fourteen teeth are thrown into a circle, they should completely fill that circle. (See Fig. 6.)

The six incisors mean diameter, in line, measure the same as the two bicuspids and two molars on either side, forming again an equilateral triangle. (See Fig. 7.)

Digitized by Google

Digitized by Google

Digitized by Google

The six incisors of lower jaw fill just one-third of the arch, the bicuspids and molars filling the balance of the circle.

The arch of the six incisors in the lower must be one-twelfth of the main circle to permit perfect lateral movement and action of all the grinding and cutting surfaces in common in mastication and incising.

As this arch is the one-twelfth of the main circle, so it will be found absolutely correct that the one-twelfth of this smaller circle will furnish the rule which gives us the width of the central incisors of the lower jaw, and why they should be the smallest of all the teeth in the human jaws.

The grinding or masticating surfaces—I use the old nomenclatures—will be found to have the same absolute shape and curves, and each tooth surface varies in depth as you leave the incisors backward to the last molar. They have ever been and must always be so.

The faces on all sides of each tooth in both upper and lower jaw vary as you find them in the arch. No one tooth can be substituted for another, nor be interchanged.

The teeth of each human being are so proportioned that the lower cannot contain the teeth of the father and the upper of the mother, or *vice versa*. The laws are rigid, or else there would be no smooth working of the teeth one upon the other in action.

It is true for the upper and nether millstones, and we could not ask less of nature's work.

Nature, left to herself, always brings proportion. It is this law that is herein stated, and if law has any value as a guide, then we have it to absolute perfection in this most wonderful piece of mechanism, which has no mistake of nature on its face, but, on the contrary, the mark of retrogression everywhere depicted from civilization and man's unwise interference.

To go into every detail of this beautiful piece of wisdom would make us overstep the limit of time assigned.

We will proceed to the description of the working model before us and the drawings geometrically and mechanically correct to the original scale life size. Kindly give me your

Digitized by Google

undivided and unprejudiced attention, and when you have gone to your homes and studied the whole subject, as it deserves, you will find that it is worthy of some consideration as a truly scientific way of getting at an ultimatum by which evolution shall be decided to be as much of a fallacy as it has been an hypothesis.

I beg of you, further, to come to me for private solution of it, where more can be gained than merely as a public listener.

I ask only fair play, and that you watch me as I proceed. I can afford to wait for the verdict.

DESCRIPTION OF DIAGRAMS.—(ONE-THIRD NATURAL JAW.)

(For full size see page facing 232.)

Fig. 1. Shows an equilateral triangle of four inches—the average size of the lower jaw of man, within its circle, with a vertical line from its summit to its base and at right angles with said base.

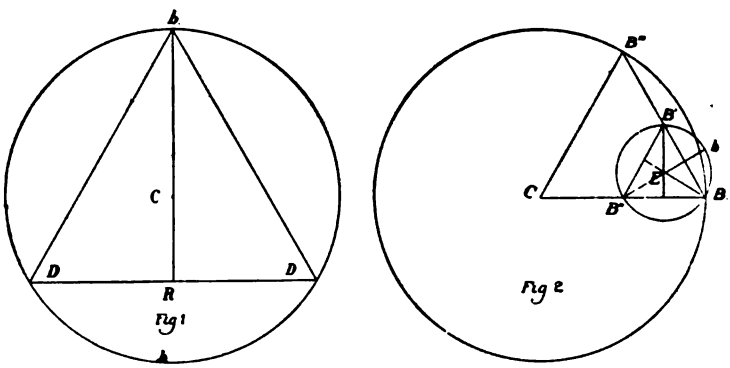


Fig. 2. The first step in the formation of the arch of the six incisors of the lower jaw, made by forming an equilateral triangle within the radius of a circle of the main equilateral triangle of four inches, as in Fig. 2, BCB'''. Divide the line B to B''' at B'. Form an equilateral triangle of BB'B''. Find the centre of the equilateral triangle at E, and the arc described from Bb to B' will be the normal arch of the six incisors of the average lower jaw, which corresponds with the size of human teeth as found in any jaw of four inches, and is the same as found in Figs. 3, 4, 5, 6.

Digitized by Google

Fig. 3. The second step taken in the application of the definite arch as proportioned in Fig. 2. By placing one point of the dividers at E (Fig. 2), the centre of the equilateral triangle BB′B″ and the radius of the circle BbB′B″ and placing it at E (Fig. 3), and describing the arc aba′ intersect said arch a and a′ by placing one point of the dividers at b. The dividers placed at D and D′ and at E will also intersect at a and a′. A line is now drawn from a to D on one side and a′ to D′ on the other, which are the lines on which the bicuspids and molars are found; f and f″ being their limit. It will be found that f is equidistant between D and b and D′ and b, and the length f′ to a will be found also to be the mean diameter of the six lower incisors or the length of a line from a, b to a′ (Fig. 7). Then, as these lines are all equal, we have the six incisors and the two bicuspids and molars on either side, as in Fig. 7, forming an equilateral triangle of aba′ and o; or a perfect circle, when all united.

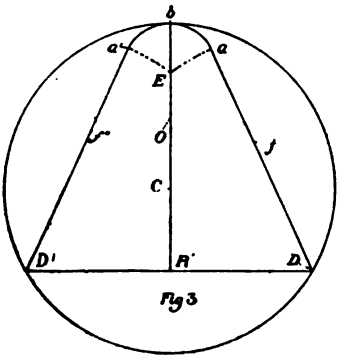


Fig 3

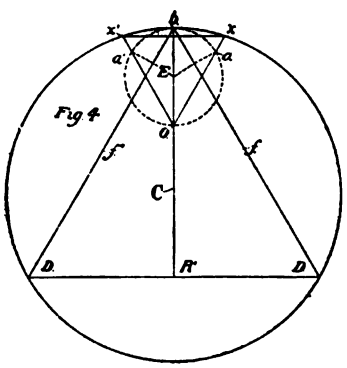


Fig 4

Fig. 4. Is the third step in showing the equilateral triangle made by the six incisors on one side or the line from X to X′, and the bicuspids and molars on the other lines from X to o and from x′ to o. The lines from O to X and o to x′ intersect at a and a′ and are fully shown in Fig. 7.

Fig. 5. Is the fourth step in the design to complete the arch of the lower jaw, given the width or size of each bicuspid or molar corresponding with the first arch BB′B″ (Fig. 2), and all the succeeding arches in the main equilateral

Digitized by Google

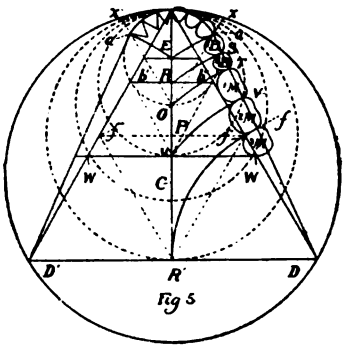


Fig 5

triangle DD'b until the full limit is reached for any efficient tooth.

Fig. 6. Shows the six incisors of the lower jaw from ab to a', making one third of the circle (Fig. 2.) from BbB'B'', E' being the centre. From a to o (Fig. 6.) on one side and a' to o on the other are the bicuspids and molars of the lower jaw, which, when drawn into the circle, form the complete circle; showing that three times the diameter here, as from b to B'' (Fig. 2), will not make exactly the circumference BB'B''.

Fig. 7. The same teeth as in Fig. 6, but, when thrown into straight line they make an equilateral triangle, agreeing with Figs. 2, 3, 4, 5 and 6.

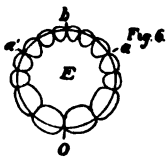


Fig. 6

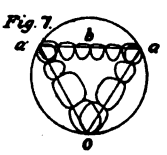


Fig. 7

Fig. 8. Is the hexagon or six equilateral triangles representing the cell of the honey bee, which structure cannot be changed to a more perfect shape. The equilateral triangle, as found in all these figures, corresponds.

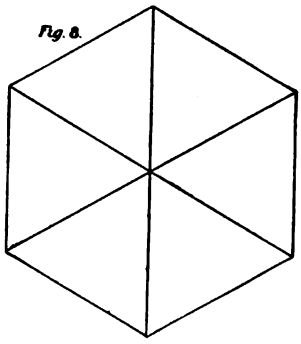


Fig. 8.

Fig. 9. Is the normal shape (side views) of the superior and inferior central incisors, marked SI and II, d marks the cutting edge of SI and e that of II, a is the curved line on the palatal surface of SI, which agrees with the angle of the first superior bicuspid in Fig. 10 at a. The width between d and e in Fig. 9 is greater than in Fig. 10, d and e. Figs. 16 and 17 show that from the centrals the cuspids are not so long nor the grooves so deep as one

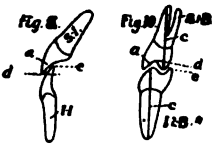


Fig. 9.

Digitized by Google

passes back to the second molar. There could be no cusps on a tooth at D.

Fig. 10. Normal shapes of first superior and second inferior bicuspids which have the angle of the equilateral triangle, on grinding surfaces.

Fig. 11. Shows superior and inferior central incisors of abnormal "over-bite" from d to e.

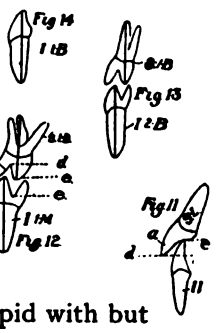


Fig. 12. Superior and inferior molars showing excessive and abnormal "over-bite," corresponding with Fig. 11.

Fig. 13. Abnormal over-bite of the first superior and second inferior bicuspids, corresponding with Figs. 11 and 12.

Fig. 14. Shows the first inferior bicuspid with but one true cusp; it should be named unicuspid.

Fig. 15. Is a side view of the human teeth from the central incisor to the second molar, giving the law of the "over-bite" and length of the cusp and curvature of the ramus.

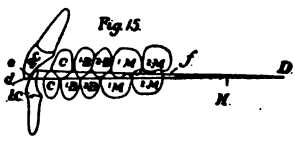


Fig. 16. Shows much plainer the depth of each groove when articulated, from the central to the condyloid processes.

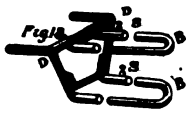
Fig. 17. A back view of the human teeth showing the process of mastication. As here arranged the left side is where all the mastication is done; while upon the opposite

side (right) only the molars and bicuspids, all the way to the central, touch upon their palatal and buccal side, merely to hold the jaws, touching perfectly on only one-half the surfaces; on the right side, no mastication could take place. Both sides are used in mastication, but alternately.

Fig. 18. Is a one-fourth size of the anatomical articula-

Digitized by Google

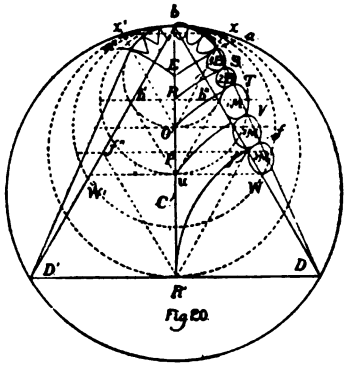
tor, in which all artificial sets of teeth are placed to have them arranged, obeying the natural law which places the inferior central incisors at the median line four (Fig. 4) inches from the condyles D and D'. B and B' are removable



bows of metal upon which the plaster casts are cemented. These are held firmly by screws S and S'. Any number of casts can be articulated on the same base, at the same time, without destroying any of them.

Fig. 20 is a more complete showing of Fig. 5.

Fig. 21. Is the scale by which the width of the central incisors of the lower jaw is obtained and from this all the other incisors, the one-twelfth of the circle (Fig. 6) as found in Fig. 2, will be when thrown into a hexagon and one section of it taken and thrown into an equilateral triangle and the centre of this forming a circle and the radius will prove to be the exact width of the central incisor of the lower jaw. To obtain the exact width of the inferior central incisor take this circle, which is the same as in Fig. 2, a segment of which, from B to B', is the exact arch of the six inferior incisors, and throw this circle into a hexagon, as was done in Fig. 2, to obtain the arch of the inferior incisors (which is one way to measure the circle correctly).



Take one section of the hexagon, A, A'', C' (which is an equilateral triangle). From A to A' will be $\frac{1}{12}$ of this circle or $\frac{1}{2}$ the line of the equilateral triangle, A, A'', E'. Now describe a circle from within A, A'', E, and its center will be found at C''.

Get an equilateral triangle, A, A', E. Take the line from A to A', at B, and it will be found to be the exact width of of the inferior central incisor, belonging to an equilateral triangle of the size of Fig. 23.

Digitized by Google

Transfer the circle, A, A′, E, to Fig. 22, at B, and the width of the central is found where it intersects the main circle.

The lateral is found by placing one arm of the dividers at D and the other at O, or where the circle A, A′, E intersects the vertical line R′ to b, and describing a line from O to the right, and where it intersects the smaller circle (Fig. 6) is found the exact width of the inferior lateral incisor.

The cuspidati is found by placing one arm of the dividers at D and the other at c′, and draw a line to the right, and

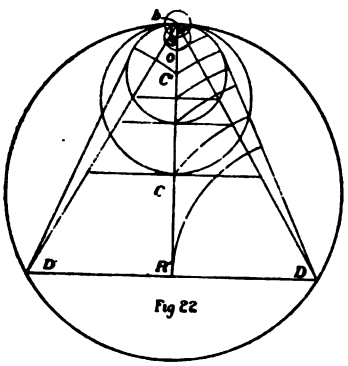


Fig 22

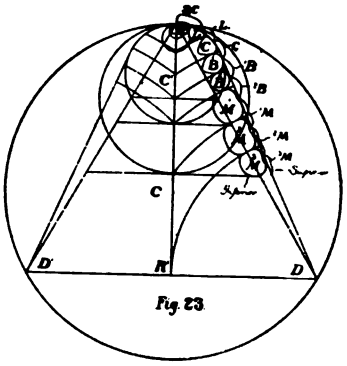


Fig. 23

where it intersects the line from D to a, Fig. 23, will give its exact width. It will also be found that at this point of intersection of the line from D and the one from C′, that it is exactly one-third the smaller circle, and also the limit on either side of the cuspidati.

Fig. 23. Shows how the width of the superior central incisor is obtained.

Place one arm of the dividers at D and the other point at S, Fig. 22, or the center of the circle, Fig. 24, and making a line to the right, where it intersects the large circle, Fig. 23, which gives the exact width of the superior central incisor and its proportion to the lower incisor teeth.

Fig 24 Fig 25

The other superior teeth are gotten in the same way as the lower, by throwing each into circles and equilateral

Digitized by Google

triangles in these circles, commencing first with the smallest circle, Fig. 24.

Fig. 25 is a separate drawing of Fig. 21, A, A', E being the point of the angles and C'' being the center.

ADDENDA.

It must be understood that this article does not cover the subject in all its arguments. It will be found later in book form, and the completest details given.

Forty-five minutes for such a subject that has never been introduced before except in a synoptical way would forbid completeness save so far as it goes.

In the dealing with this new subject against evolution, my argument and scientific method must be followed to the letter, not here and there one or more of the claims be picked out and the main question allowed to go unanswered. I ask no advantage if it is taken up on its true merits.

DISCUSSION.

DR. GEORGE A. MILLS, of New York. Two years ago last winter, I had the pleasure of witnessing a demonstration by Dr. Bonwill; it made a profound impression on my mind. As far as the discussions are concerned and the truth of the statements made, I have to say that this paper is exceedingly valuable, although it may not be understood within the next ten years or perhaps longer; it is very important, and I think we have the basis in it for much valuable information and instruction.

DR. EBEN M. FLAGG, of Asuncion, Paraguay. I am one of those who believe in trying to reduce the various manifestations of nature to mathematical precision. The essayist made one point, where he spoke of a monkey's eye-tooth, that inspires me to mention a little circumstance. Some years ago we had a Paraguay monkey that was tame. One morning the monkey bit a child, and I made up my mind that that should not occur again, so all the canine teeth of that monkey were cut off flat. According to Dr. Bonwill's theory, that monkey should have pined away and died; but

Digitized by Google

instead of that, it lived, got very fat, and is now on board the United States man-of-war "Tallapoosa," where any one can see him in a flourishing condition. Dr. Bonwill may say that this case was not parallel, that the monkey was pampered and fed with all sorts of luxuries, and therefore the rule did not apply; but if Dr. Bonwill does say so, what is that more than announcing the evolution of which he speaks?

DR. L. P. HASKELL, of Chicago. These demonstrations of Dr. Bonwill are very interesting. As far as I understand his principles, it seems to me that they are admirable. I have been employing his method in the arrangement of the upper teeth. He commences with the lower ones; I have wanted for a number of years to see him articulate a set of teeth, starting from the foundation.

With regard to the upper teeth, I have for a long time been carrying out that principle. The radius of the circle is the width of the central, lateral and cuspid. When I had a patient with a perfect set of teeth, I applied that circle and found it to be perfectly true. A line drawn across the posterior surface will come across the posterior margin of the second molar. But there is this fact: I select a set of teeth for a certain case, and take my dividers and measure. I am surprised to find how few circles are needed for the different sizes of teeth. I use my judgment for the various cases which come to me, of course. It occurs to me just at this moment that dentists are often at a loss to know what was the width of the superior teeth. If you have the six lower anterior teeth, you have a positive guide as to the width of the upper teeth. You will make no mistake in selecting the proper size tooth if you follow this method.

Dr. Bonwill said some time ago that Dr. Talbot made a certain statement which I have learned Dr. Talbot never made. My attention was called to the fact that in ninety-five mouths out of one hundred there is a depression in the region of the cuspid. I wish the term "canine tooth" were banished from our text-books and vocabularies. What is the use of applying the name of a dog's tooth to a human

Digitized by Google

tooth? Cuspidatus should be used instead, and would be just as well understood. In the region of the left side of the mouth, in ninety-five cases out of one hundred, by actual count, there is a depression. The alveolar process is shorter on the left side than on the right. In many artificial sets you will notice that the teeth are shorter on the left side than on the right. The dentist has arranged his teeth by the model, and he gets the teeth shorter on that side. On the lower jaw, at the left side, it is very common that the teeth are higher and more prominent than on the right side. On the lower jaw it is also very common that the right side is farther from the median line than the left side. If you want to arrange the set symmetrically, you will find that you must set the teeth farther in on the left side than on the right, because the right side is so often more prominent. Why is this so? I have been asking the question many years, and have finally adopted Dr. Talbot's theory. The majority of people bite their food off on the right side of the mouth. It is more common to masticate on that side of the mouth, and therefore the right side is more developed than the left. I held on to that theory until two or three years ago Dr. Talbot became interested in the difference between the two sides of the jaw, and we made several careful examinations of models which I have in my possession. Dr. Talbot did not say that we could not or did not chew on both sides of the jaw; what he said was that the lower jaw moves from right to left in mastication. We do not chew from left to right. You can chew on the left side of your mouth, but try to throw your jaw from left to right, and you will see how awkward it is. The result of this is, that there is a gradual change in the alveolar process. Throwing the alveolar process to the left naturally makes a prominence on the right side.

DR. J. J. R. PATRICK, of Belleville, Illinois. I am sorry that I am not capable of discussing this question, for I have not studied mathematics sufficiently. This is equal to a display of pyrotechnics. I am almost appalled. I shall not attempt to answer the essayist in detail, but, fortunately for

Digitized by Google

me, he has laid down, in the commencement of his essay, a series of propositions which I shall take the liberty of analyzing.

The first one is, that the human jaw and teeth show beyond a doubt the workings of ultimate laws, which give them the highest efficiency, and from which organization there could be no change, except retrogression, not progression to a higher order. I would like to ask any one what conception they have of progression without retrogression. Have you any conception of light without darkness? "Too much light is darkness; too much life is death." We are creatures of circumstances. Everything in this world is relative; you cannot escape from it. You have no conception of progression without retrogression. One stands upon the other. It may do for a rhetorician or a grammarian to talk about the past, present and future. The past has not ceased before the future commences. There is no present. Put it as you will, the first proposition is rotten to the core.

The second clause is, that the human jaw has a basis for its organization, and works upon the principle of an equilateral triangle, which underlies the shape of every tooth. Am I to understand that the mandible and the superior maxilla are equilateral triangles? I have always understood them to be parabolic curves. They have not an equilateral or a quadrilateral motion in any direction you may place them. One of the most astonishing things is, that the essayist has not stated what kind of a lever a human jaw is. He has not told us whether it was one of the first, second or third orders.

The principal muscles that move the jaw are the masseters and temporals; they move the jaw, but not on a triangle. The power is placed between the fulcrum and the anterior portion of the jaw at the angle of the ramus, and when that jaw either opens or closes, instead of describing an equilateral triangle, it describes a circle. It cannot possibly do otherwise. There is no square movement in the human body. Not only in man, but in every animal in creation, the muscles and their attachments to the bone, which

Digitized by Google

are the levers, are all levers of the third kind. My leg in moving this way (illustrating), is a lever of the third class; but when I spring on my toes, it is a lever of the first class. When I lift my leg, it is a lever of the third class. The jaw never becomes a lever of any other kind than of the third class, because it does not support the body. The gentleman has failed to mention that in his essay. The triangle, equilateral or any other kind, cuts no figure in the motion of the jaw, because it moves on a fulcrum. The power is in certain muscles, attached between the fulcrum and the body to be moved, and it is impossible for it to move in any other manner than that of the arc of a circle.

According to the essayist it is based on the principle of an equilateral triangle, which underlies the shape of every tooth, and the numbers to occupy that equilateral space. I contend that it is not an equilateral space. The teeth do not follow that rule, because not one of them is an equilateral triangle. The lower teeth are parallelograms; the upper teeth are parallelograms rhombed, on account of the greater curve of the arch. You cannot get an equilateral triangle out of any one of them.

As to clause third, it is merely a repetition of the second clause.

As to clause four, I will say that I am not a creator, nor the father of a creator. I am perfectly satisfied to investigate that which has been created for me. It is a bold man who will say that the Creator has made anything wrong, or that he could not produce a human being on the square just as well as he could on an equilateral triangle. I am only sorry that he has not produced more men on the square than he has.

The essayist says he claims not only to have discovered a law by which organizations are made. Don't forget that. He has discovered it, and yet he cannot tell why he smells with his nose, and sees with his eyes. He cannot say why he should not see with the tip of his nose, and smell with his eyes, and yet he says he has discovered the law of organization. You cannot make an inch of progression, according

Digitized by Google

to our essayist. How did the essayist ever progress to this point, if progression is a fallacy? Don't you know that you have to learn to count your fingers and toes before you can master abstractions. Don't you know that single numbers have to be learned before millions? Why, the gentleman himself some years ago wrote an elaborate history on the Evolution of the Mallet. Evolution for the mallet, but for nothing else!

As to clause five, I will accept all the statistics, but I want you to prove the figures.

In clause eight, the essayist refers to an ultimatum. It will be necessary to know what an ultimatum is. If you contend with any man on a principle, and especially on anything that is of a scientific nature, you must always stop to ask, "What do you mean?" because most of the terms are ambiguous.

Dr. Bonwill speaks of fraud. I do not suppose any man here thinks that Dr. Bonwill would be guilty of a willful fraud. I know I do not think so. The man may be in error, but it is not fraud.

Nature never does anything really correctly. We all look like human beings, and yet there are not two of us alike. Take a family, and it is just the same. Take an artist, on statuary, and what does he do to perfect a Madonna? He will take an arm from one, a leg from another, a breast from another, and when he has completed his work, it is not exactly like any human being under the sun; and yet we know Nature better by his production than by the productions of Nature itself; because he has taken all the perfections that Nature has been capable of, and by a skillful judgment, something that can never be taught, something that can be seen but never explained, he combines and produces a perfect form. There is no perfection. Take a full set of regular teeth, and you will find that some, to the right or left, have cusps in excess, or are deficient. They may be regular in alignment, but vary in form; and so, if there is a law that is as constant as the law of gravitation, that law is variation.

Digitized by Google

The essayist says it is claimed that selection could only have produced a pre-existing organism, or previous type. I do not know where he obtained that information; but I tell you, it is just the reverse of what is commonly called Darwinian advancement—just the reverse of what evolution has done, because one of the strongest arguments in evolution and variation is the law of selection, and in place of producing pre-existing types, the law of selection produces other types. Go to any gardener or horticulturist, or propagationist, in either animals or plants, and he will tell you that it is only by acquired knowledge that they give us the fine fruits which are produced. All flowers are single in their wild state; it is by selection they have been produced double.

As for clause ten, as far as mechanical means are concerned, there is nothing in existence but what is produced by mechanical law, bad, good, or indifferent, whether it is an improved type or a retrogressive type. The whole universe is moved by mechanical laws. There is not a molecule in your body but that evolves and develops into a perfect organism only by strictly mechanical law. Take a human being, at the commencement of its existence, or any animal or vegetable, commencing with the seed, and go up to the perfect organization, *i.e.*, as perfect as it gets to be. Some only go half-way, and some a little farther. If there were no such thing as progression, we could not learn anything. The mere fact that you can learn the alphabet shows that there is progression, and the mere fact that you began as a little bit of jelly, and finally became an osseous, muscular and arterial combination, shows that there is progression. Dr. Bonwill cannot deny that he has progressed.

As for clause eleven, I will say that in a large class of animals they do reproduce organs; for instance, a crab or a lobster will reproduce claws. You rarely find a crab with two claws the same size; they generally lose them in combats.

As for clause twelve, there are very many reasons, but it would take me a long time to show you why the deciduous teeth are a necessity; and it is also a question of growth.

Digitized by Google

The deciduous teeth are never replaced by other deciduous teeth, as the author seems to indicate; and furthermore, the deciduous molars are never replaced by anything resembling a molar. The permanent teeth that succeed the deciduous molars are bicuspids.

In conclusion, I wish to say that while some of the apostles and followers of Darwin have unfortunately exceeded their master, and carried his theories beyond anything he ever dreamt of, there is, on the other hand, a set of thinkers and writers who have never read Darwin thoroughly, and it is impossible to deal with the subject of evolution intelligently unless one understands comparative anatomy. One cannot comprehend Charles Darwin's writings without being a naturalist, and having a good acquaintance with comparative anatomy and of all the natural sciences. You may believe in Darwin, but you do not understand him if you do not understand comparative anatomy. On the other hand, men write against Darwin who never read him, and who could not possibly understand him if they did. I would not say that any man would come before an intelligent body of men, and talk upon a subject of this character, without having first thoroughly posted himself on the negative side of the question. I have known very able and educated men, who, when pushed to a corner, said they had not read Darwin, but had read of him. My advice is, let Darwin alone. However true or false his doctrines may prove to be, he was a modest man, a clear and sincere thinker; and by his almost unlimited knowledge of the natural sciences he has captivated the minds of the greatest thinkers in the civilized world.

DR. BONWILL. I have heard but very few words of what the gentleman has said; but I do not want any better evidence of the animosity and ridicule which he brings than in the countenance which he displayed throughout it all. What have I come here to show you? What has this gentleman said in order to contradict me? So far as my conclusion is concerned, that is another question. He is one man, I am another. He is simply following the footsteps of

Digitized by Google

other men, and he attempts to ridicule what I have done and the imperfections which I have made in my own individual work. All I ask is, simply to take and prove whether I am wrong in laying the foundation of the work that I am doing. I have a right to my conclusions, as well as every one else. You cannot find in the whole world two men who think alike. There is nothing which has been brought out of evolution that is more than hypothesis. I come here to show what I have. If I am wrong, I am a fraud, and am trying to impose on you. My friend, Dr. Peirce, will grant that I have something to work on. He has already told me so. I am not abashed by my friend Patrick. I had a gentleman once take off his coat and go to work in his shirt-sleeves to upset something that I had said, but he had to accept it after all. What I ask you to do is to follow me in every line that I have given here, and prove whether I am right or wrong. When I say that I know what the organization of the first man was, I do. That gentleman has not followed me in one single line. He did not hear me speak on the subject. How can he come here and speak against it? As far as Dr. Flagg is concerned about the monkey's teeth, I say that if I cut those teeth off short, the animal will die, perhaps not immediately, but its life will be shortened proportionately. When Dr. Patrick attacks me, I do not attack him. I did not hear what he had to say. I will read it; but I could tell from his face that he was speaking against me. No man has a right to speak against me until he knows exactly what I have been talking about.

DR. C. N. PEIRCE, Philadelphia. In the absence of Dr. Patrick, I simply want to make one remark. Dr. Patrick did not come here to reply to Dr. Bonwill. Dr. Bonwill had written thirteen conclusions, and those conclusions, as Dr. Patrick showed you, were utterly uncalled for, and inconsistent with the text. I told Dr. Bonwill before he came before you, several months ago, that these conclusions could not be drawn from the text. When he made the statement that animals did not reproduce organs that were lost, he made a statement that was utterly false, and was disproven

Digitized by Google

by thousands and thousands of examples in animals. Now, when he publishes this statement, he must expect to have it criticised. When he makes a statement that there has been no change in the human jaw, I ask you to look into the mouth of any patient that comes to you, and see the difference. We have what we call a monstrosity, which we wish to correct, which is a variation from the normal condition. Dr. Bonwill expects to see a sudden change. If you want to get a good idea of the change that takes place in Nature, take pure water, put a few drops in one jar, and a few drops in another, and so on, all of the same kind, and you will find that there is a great difference between the first and the last jar, although they were taken from the same source.

Dr. W. X. SUDDUTH, of Minneapolis. In the discussion of this subject, we do not want to lose sight of one essential point. Dr. Peirce has said that Dr. Bonwill's deductions are not borne out by his observations, to the full extent; but that Dr. Bonwill has discovered a law that governs the articulation of the human teeth as we find them at the present time, and it is a law that, taken and applied to this articulation that he has developed, gives us the best and most practical articulation that we can make for artificial dentures, so far as my experience goes. We are all, to a greater or lesser extent, specialists, and we are very apt to ride our hobbies very hard. I think in the discussion we have had here today that we have had as marked an illustration of this particular truth as you will ever have in your life. In several of the points where Dr. Patrick has answered Dr. Bonwill, he has, whether intentionally or not, evaded the point at issue, and discussed the question from a different standpoint. I do not think that science gains any benefit from any such discussion of papers, and I was very sorry to see Dr. Patrick take so extreme a stand as he did in answering the question. There is a principle here that will be a benefit to every dentist who will study the law and apply it in his practice as far as possible, as Dr. Haskell testifies he has done.

DR. PAUL SCHWARZE, of Leipzig, Germany. Gentlemen, I ask your pardon if I am not able to express my

Digitized by Google

views upon this subject in such a fluent manner as the gentlemen did who spoke before me. But I cannot help thanking the last speaker (Dr. Sudduth) for his kind words. And I take the opportunity to state that the Bonwill articulation method is on the way to conquer Europe, as I know from many communications received from different countries. At least there will be only an appreciable amount of time necessary to conquer Germany, *for three-fourths of the students of Germany* are educated in the use of the Bonwill articulator and his method of articulating teeth in this kind of work. It is greatly to the merit of Prof. Warnekros having introduced this method in the Dental Department of Berlin after I myself brought it before the School of Leipzig. This shows that there must be something about this matter. I wish to draw the attention of the American dentists to this fact, and add that not only for mechanical dentistry it is important to know this method, but also for the operative part.

There would be, for instance, not such a different variety of views about the extraction of the six year molar if everybody knew how important it is whether this tooth is in its proper place, keeping the jaws far apart, thereby avoiding a deep overbite and crowding of the front teeth. Everybody would try to save the temporary teeth as long as possible, filling the approximal cavities with gutta percha, thereby widening the space and pushing back the six year molar as far as possible. There would not be the failures in crown and bridge work which, I contend, are mostly due to improper articulation. Concerning the question of evolution, I don't think that dentists in general are very much interested in it, and I do not think that this question belongs to the *dental* profession. But I understand the standpoint of Dr. Bonwill, having done the entire set you saw just now myself. I therefore know that this articulation cannot be changed except retrogressively, unless you spoil it.

The subject was passed.

Digitized by Google

SECOND SESSION.

The Section met Wednesday, August 16th, at 2:30 P. M., the Chairman, Dr. R. R. Andrews, presiding.

The following paper was read:

THE TEETH AND HAIR—THEIR HOMOLOGY AND PATHOLOGICAL INTIMACY.

By S. H. Guilford, A.M., D.D.S., Ph.D., Philadelphia, Pa.

To the scientific mind two opposite conditions have always proven of especial interest; one, expressive of the highest development of the individual of any given species, the other, representing some variation from the normal type. In one is seen and admired the result of the natural operation of those mysterious laws of nature that are known only through their physical manifestations, while in the other is observed some interference with those laws as shown in the under or over development of one or more of the parts. The first illustrates how perfect the working of those laws is when not antagonized by adverse conditions, and the second how great a variation may result from some slight and unobserved disturbance of their operation.

One condition is quite as instructive as the other, for it is often only through the consideration of an abnormity that we are led to properly appreciate and admire the harmony of co-ordinate parts and their adaptation to function. The student of Dental Science naturally has his attention particularly directed toward those organs in which he is especially interested and with him a perfect development and an abnormal condition of the teeth are of equal interest.

Perhaps no organs of the human body exhibit such a variety of aberration from the normal type and number as the teeth and this fact furnishes us with a field for observation and study that is almost limitless. But while the teeth in themselves provide an interesting topic for study, the subject is broadened and the interest intensified when we consider them in relation to other organs or structures with which they are intimately associated.

Digitized by Google

Of the epithelial products, the hair, next to the teeth, is the one that is most frequently found to be abnormally affected, and the fact that these two structures are often found to be conjointly influenced, long ago attracted the attention of scientific observers, but seems never to have received the careful investigation that its importance demands. On account of its scientific interest and with a view to ascertaining, as nearly as possible, to what extent the hair and teeth are co-ordinately affected, either physiologically or pathologically, your essayist decided to present the subject on this occasion, and he does so with the feeling that if its consideration should not lead to any new conclusions it may at least awaken interest and stimulate to further investigation.

In approaching the subject it will be necessary first to briefly consider the origin of each of these structures. The ovum of the vertebrates consist of a mass of protoplasmic matter contained in a connective tissue envelope. By a process of segmentation the ovum produces a vast number of cells that form a membrane known as the blastoderm and this eventually is resolved into three layers, respectively denominated the epiblast, mesoblast and hypoblast. "From the epiblastic or upper layer are formed the epiderm or cuticle of the skin and all its appendages, such as the hair, nails, and enamel of the teeth; also the brain and nerves. From the mesoblastic or middle layer are formed the true skin, cartilage, bones, muscles, dentine and cementum of the teeth, etc. From the hypoblastic layer are formed the epithelium of the mucous membrane and the various glands of the alimentary canal." *

Hairs, therefore, are a product of the epiblast and are developed inside of pouches or sacs from the infant cells of the rete Malpighii which dip into the underlying corium. As they develop they push their way to the surface, attain their normal length, are shed, and again replaced by others. They are nourished by a formative organ known as the follicle.

Hair of varying length and fineness covers the entire external surface of the human body, with the exception of the

* Cryer—Amer. System of Dentistry. Vol. 1, p. 142.

Digitized by Google

soles of the feet, palms of the hands, the eyelids, the last phalanges of the fingers and toes and certain portions of the genital organs. Its greatest length is attained on the head, especially of the female, upon the cheeks, chin and upper lip of the male, and in the pubic and axillary regions of both sexes. Darwin says: "Hair is first developed in human fœtuses at about the third or fourth month, when it appears on the eyebrows and face and especially round the mouth where it is much longer than on the head."* At this early period of intra-uterine life no difference is noticeable between the male and female fœtus in regard to the abundance or location of this growth, whereas in early childhood and especially after puberty the difference between the sexes in this respect is very apparent.

The downy growth or lanugo with which the human fœtus is covered is shed just before or at birth, and is succeeded by a less vigorous growth which in the normal individual continues through life. This growth under peculiar abnormal conditions may be entirely lacking, or it may, in the case of "sports" or "freaks" attain an unusual length, owing to an excessive vitality of the follicles. Probably our earliest historical representative of this latter condition is Esau.

We believe all biologists agree that mammalian teeth, if not indeed the teeth of all the vertebrata, are developed in a sac or a pouch formed in part, and in its earlier stages, by a dipping down or invagination of the oral epithelium which in time becomes the enamel organ. That under this depressed epithelial layer a papilla arises from the corium beneath, from which the dentine is formed; the said papilla being eventually known as the dental pulp. The cementum is formed from what is known as the dental sacculus, a specialized product of the connective tissue which encloses both the enamel and dentine organs, completely surrounding them.

Such being the origin of the tooth and its different tissues, are we correct in calling the mammalian tooth a "der-

* The Descent of Man. Vol. 1, p. 25.

Digitized by Google

mal appendage?" Speaking of teeth in general, Wortman says: "Morphologically considered, teeth are specialized dermal appendages, situated in the buccal cavity and characterized by the presence of certain calcified tissue, developed from the true derm or corium of the integument, known as dentine. According to this definition the term 'tooth' is limited to those structures of the oral cavity which alone possess such tissue, although it is a recognized fact that to other epithelial or cuticular structures found in many invertebrate and some few vertebrate forms the term 'tooth' has likewise been applied."*

"While all subserve the same purpose, and are therefore analogous, their chief distinction consists in this: the latter consists of a corneous or horny substance which is invariably derived from the more superficial epidermal layer, and is therefore *ecderonic* in origin, while in the former a papilla arises from the corium being sunk into a fold or pit, and eventually undergoes more or less calcification from its summit downward by a deposition in its substance of lime-salts, forming dentine, and are therefore *enderonic*." (Wortman.)

"Those of enderonic source are found only within the limits of the vertebrata, and vary in form from the simple cone usual among fishes to the higher complex grinding organs of certain herbivorous mammals. They all agree in being developed from the corium of the lining membrane of the mouth, which is continuous with, and really a part of the integument invaginated at an early period."

The close relationship existing between the teeth of certain vertebrates and their dermal armature or scales is best seen in the shark, dog-fish and other elasmobranch fishes.

Of the placoid scale of the shark, Gegenbaur says: "The placoid scale has the structure of dentine, is covered with enamel, and is continued at its base into a plate formed of osseous tissue; as they agree with the teeth in structure, they may be spoken of as dermal denticles."† "In the early embryonic stages the integument bearing these dermal

* American System of Dentistry, p. 352.
† Elements of Comparative Anatomy.

Digitized by Google

denticles is pushed into the oral cavity, where they become somewhat enlarged and appear in the adult form as teeth."* "No one can doubt (says C. S. Tomes) whether from the comparison of the adult forms, or from the study of the development of the parts, that the teeth of the shark correspond to the teeth of other fish, and these again to those of reptiles and mammals; it may be clearly demonstrated that the teeth of the shark are nothing more than highly developed spines of the skin, and therefore we infer that all teeth bear a similar relation to the skin."†

Such is the analogous reasoning of some of our best known anatomists and physiologists regarding the teeth as "specialized dermal appendages," and while it is accepted by biologists as reasonably conclusive, further reasoning supported by facts may serve to throw additional light on the subject. As each of the various blastodermic layers gives origin to a variety of tissues, is it not reasonable to suppose that where one tissue of a certain layer is pathologically affected others of the same layer may also be, and if in a number of instances such is shown to be the case is it not evident that all of these tissues have the same origin?

Instances are not wanting among the vertebrata where an abnormity in one product of the epiblastic layer is accompanied by a corresponding one in another of the same layer. We know that in the order of edentata in which some of the individuals are without teeth and others are lacking the normal number their integuments are also very variable in character.

In the hairless dogs of China and Japan the dental system is said to be greatly reduced as compared with others of their class who have a normal hairy covering. The manatee or sea-cow, which is an herbivorous aquatic animal, having stiff hairs or bristles sparsely scattered over its skin, has a most peculiar and imperfect dentition, differing from that of any other class of mammalia.

Ascending the scale to man we find many evidences of

* Wortman, American System of Dentistry, p. 354.
† Dental Anatomy, p. 2.

Digitized by Google

the same relationship between products of the epiblastic layer. In albinism the chief peculiarities are lack of coloring matter in the skin and hair, and a pink iris. Both of these tissues are epiblastic products and each is abnormally affected.

Within the past year the writer had the privilege of examining a family of hairless people from the interior of France, consisting of mother, daughter and son. In each individual there was no hair upon the scalp, the fine down or lanugo usually covering the body was lacking, and the finger nails were thick, narrow and pointed, resembling the talons of a bird. The teeth, however, were normal in size, form and number. Fig. 1 shows the appearance of the individuals, together with the character of the nails. Wilson* mentions the case of a woman, aged 33 years, who applied to him for treatment, whose entire body was covered with thick and long hair and who had never perspired. The abnormal growth of hair was not congenital, but began at puberty and remained. The same author speaks of the nails frequently showing evidences of abnormity in connection with either absence or superabundance of hair.

FIG. I.

Dr. E. P. Bradbury,† of Boston, reports the case of a man, aged 24, who was edentulous and claimed never to have erupted any teeth. This peculiarity was accompanied

* Lectures on Dermatology, 1878, p. 110.

† Boston Medical and Surgical Journal, 1879, p. 342.

Digitized by Google

by an entire absence of saliva. His tongue was dry and leathery and his speech thick. He had never been able to take solid food of any kind, but subsisted on soups and soft food.

FIG. II.

Coming now to the correlation of the hair and teeth, which is a matter of greater interest to us, let us consider such cases at our command in which an abnormity of one tissue is accompanied by abnormity in the other. It will be noticed that in some instances deficiency of one product is accompanied by deficiency in the other: whereas in others deficiency of one is associated with redundancy of the other. Of the first class—deficiency of both structures—the most notable instance on record, and perhaps the only one of its character, is that of a man whom the writer exhibited before certain medical and dental societies in Philadelphia, in 1883, a full account of which, with genealogy and verification, may be found in the *Dental Cosmos* for March, 1883.

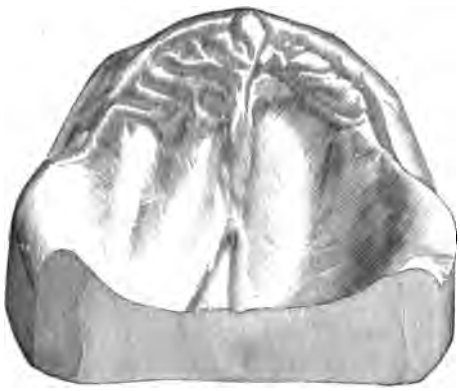


FIG. III.

The individual was 48 years of age, and had never had any teeth, either temporary or permanent. His head was nearly bald, being only slightly covered with fine down, and while hair was present in the pubic and axillary regions the surface of his body was entirely lacking in the surface-hairs

Digitized by Google

or lanugo usually present. Owing either to the absence or suppression of the sudoriparous glands, he had never perspired. In addition to these peculiarities he had no sense of smell and very little sense of taste, a combination of peculiarities which literally constituted him "sui generis." He is still living and in good health, and of his six children only two (girls) show any signs of inherited abnormity, and then only in having about half the usual number of teeth. Fig. 2 illustrates his appearance, and Figs. 3 and 4 his jaws.

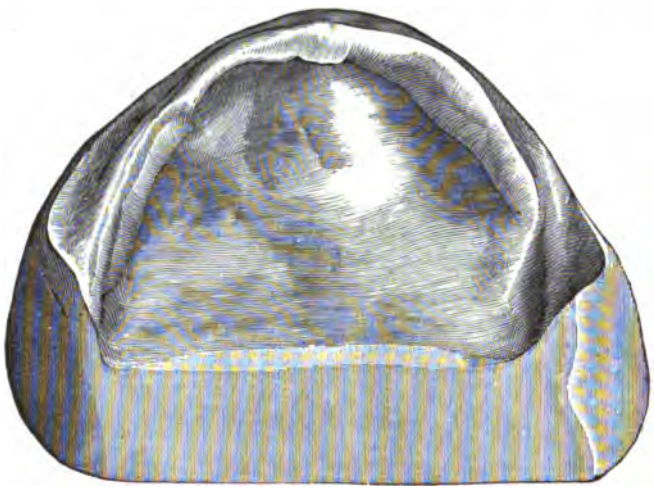


FIG. IV.

Another case of somewhat similar character but much less marked is reported by M. Jarré, of Paris,* a translation of which appears in the *Dental Cosmos* for June, 1892. The subject was a boy, twelve years of age, whose scalp had a scant covering of hair and whose body was entirely free from surface hairs. The lower jaw was edentulous and the upper jaw contained but five teeth. The finger nails also presented an abnormal appearance, being covered with white spots and streaks.

Of the second class, in which deficiency or abnormity of the teeth or jaws is associated with excessive development

* Comptes Rendus de la Société de Stomatologie de Paris, III, 1891.

Digitized by Google

of the hair, there are several notable instances on record. One of these is the well-known case of Julia Pastrana, a Spanish ballet dancer, who appeared in Europe many years ago. The hair upon her head was dark, coarse and strong, while upon her cheeks and chin she wore a full beard several inches long. Her dentition was normal as testified to by both M. Magitôt and Sir John Tomes, who examined her mouth, but the alveolar and overlying soft tissues were hypertrophied to such an extent that only the coronal surfaces of the teeth were visible.

Another case mentioned by Parreidt,* and somewhat resembling the one just related, is that of Krao, an Indian girl, seven years of age, who was exhibited in Europe some years ago. Her body was covered with a well developed growth of hair, and her jaws presented the same hypertrophied condition as those of J. Pastrana, her teeth being normal in number and form. A more remarkable example, in which an abnormal growth of hair was associated with a deficiency of teeth, is that of Fedor Jeftichejew, the so-called dog-faced man, who has been exhibited the world over, and whom your essayist had the privilege of examining less than a year ago. Fig. 5 represents the appearance of the jaws. This is reproduced from illustrations published by Parreidt. It will be seen that in the lower jaw there are three teeth, one cuspid and two incisors. In the upper jaw there are only two cuspids; one tooth, a lower incisor, having been extracted.

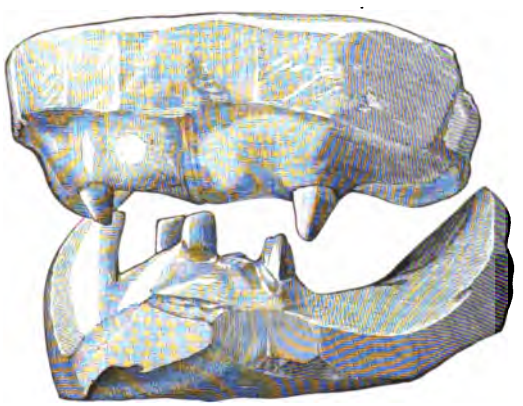


FIG. V.

* Deutsche Monatsschrift für Zahnheilkunde. 1886, IV Jahrgang, 2 Heft.

Digitized by Google

When first exhibited Fedor was about three years old, and was accompanied by his father, Andrian, who possessed the same peculiarities, but who has since died. Fedor, now a man twenty-three years of age, has his entire body covered with a fair growth of hair, while upon his face, including the nose and forehead, there is a strong growth of soft hair several inches in length. (Fig. 6.) In his case, also, the sudoriparous glands seem to be poorly developed, for he perspires but little. Still another case of excessive hair development, or *hypertrichosis universalis*, associated with a more or less defective development of the dental organs, is found in the Burmese hairy family exhibited at various times in this country and Europe. Three members of this family, Shevemaong, the grandfather, Maphoon, the mother, and Moung Phoset, the son, had their faces and bodies covered with long dark hair of a silky character. Their hands were not thus covered, but upon their foreheads, cheeks, noses and ears the growth was excessively abundant.

FIG. VI.

That upon the forehead of Moung Phoset was so long that it was parted in the middle and carried back and secured behind the head. The grandfather died in Ava, and was never on exhibition, but was seen and reported upon by Captain Crawford, who states that "the hair on the face, ears and nose was eight inches long, and on the breast and shoulders four or five inches." Fig. 7 represents Moung Phoset as seen by the writer in 1891.

As to the lack of teeth in these cases, writers differ in their accounts. Crawford says that the mother lacked the cuspids and molars in each jaw; a later writer speaks of her as lacking many of the teeth, but, as a matter of fact, Dr.

Digitized by Google

John A. Daly, of Washington, D. C., in 1888, removed no less than fifteen teeth from her jaws.

Moung Phoset, the son, is reported as lacking many of his teeth, but this could neither be verified nor contradicted, inasmuch as the exhibitor in charge invariably refused to allow his mouth to be examined.

From the seven cases recited we see in three of them an absence or scanty covering of hair on the scalp, with entire absence of surface hairs on the body. With this in two cases there was deformity of the nails, and in two cases partial or entire absence of sudoriparous glands, and in one case a total lack of the sense of smell and imperfect sense of taste.

FIG. VII.

In the four cases of excessive hair development, we find in two cases the normal number of teeth, with hypertrophy of the alveolar process and gum tissues; in one case we find only six teeth *in situ*, while in the last we have no true record of the dental organs.

But there is another source from which we can derive evidence of the intimate relation of these tissues, and one seldom alluded to, that of dermoid ovarian cysts. In these aberrations of structure, which Wilson speaks of as "normal tissues abnormally placed,"* there are usually found hair, teeth, alveolar tissue and sometimes nails, all products of the epiblastic and mesoblastic layers.

Mr. Spencer Wells (quoted by Wilson)† describes a cystic tumor containing hair, teeth, degenerated epithelial cells and bony plates. The same writer speaks of another cyst, weighing about twenty-nine pounds, containing a mass of hair about fourteen inches long, besides several well-formed teeth. Schabel (also quoted by Wilson) describes "the case of a

* † Lectures on Dermatology, 1878.

Digitized by Google

girl, aged thirteen, who had never menstruated and from whom there was removed an ovarian cyst, three times the size of a man's head, containing three pieces of bone and more than a hundred incompletely developed teeth." Many of my hearers will remember the exhibition of the contents of a dermoid ovarian cyst, by Dr. Barrett, at a meeting of the American Dental Association held at Niagara Falls in 1886, an illustration and description of which appeared in the *Independent Practitioner* for June, 1887.

The specimen consisted of a mass of hair nearly twelve inches long, a partially developed superior maxilla and twelve teeth. It was removed from a woman twenty-nine years old, and was declared, by Prof. Roswell Park, to be of congenital origin, like all others of its class. In his description of the case, Prof. Park says: "Such products arise from isolated portions of the epiblast or mesoblast, or both, which during the development of the embryo have been displaced and located somewhere where they do not properly belong. Such islands of tissue retain nearly all their embryonal possibilities, and, given an impetus, develop into any or all of the tissues which they might normally produce." *

In view of these facts, the question naturally suggests itself, "Why should these two particular products of the epiderm so often be found to be conjointly affected?" A satisfactory answer has never been and cannot now be given, but the consideration of two points may shed some little light upon the subject.

First, the development of the hair and teeth in the human embryo are more nearly contemporaneous than that of other epidermoid tissues, the first covering of hair or lanugo being noticeable about the fourth month of fœtal life and the formation of the dentine cap, or calcification occurring, according to Magitôt, at the same period.

Second, the homology of the two structures is strikingly illustrated: (*a*) in their being developed within a sac formed by the dripping down and infolding of the epithelium; (*b*) in their being first formed and afterwards nourished by a papilla

* Independent Practitioner. June, 1887, p. 297.

Digitized by Google

or follicle; (*c*) in their limitation of growth; (*d*) in their being shed and replaced, once or oftener, by structures of similar character, and (*e*) in being so commonly found associated in ovarian cysts. We are therefore justified in concluding:

First. That where one product of the epithelial layer is abnormally affected, one or more of the other products of the same layer is also apt to be.

Second. That the two most commonly affected are the hair and the teeth.

Third. That this is shown by numerous examples throughout the vertebrata, including man.

Fourth. That the intimacy between these two products is probably due to the contemporaneousness of their inception as well as to many points of similarity in their character and growth.

Fifth. That when thus co-ordinately affected the manifestations are not uniform but variable.

Sixth. That this variability cannot be accounted for in the light of present knowledge.

At the conclusion of the reading of his paper, Dr. Guilford said:

I have here a few models; one, of the jaws from which the photograph of the individual who never had any teeth, was taken. I found people who knew this person from childhood and testified to the facts. I also found his immediate relatives and traced his ancestry back for three generations.

Another does not strictly belong to the subject, but I brought it as a curiosity—where the teeth were all in place, but the crowns not being covered by enamel, wore away rapidly. It is one of Dr. Stainton's specimens.

The third case is that of an individual who was reported to me as having been edentulous from birth. The models would not indicate anything to the contrary, but after traveling a hundred miles or more to see him I found that while he had never had any temporary teeth, he had had eight permanent molars which were afterward lost.

Digitized by Google

Whenever a case of this kind is reported it is generally reported incorrectly, and to get at the facts it is necessary to have the individual examined by a competent dentist and the hereditary features carefully investigated.

DISCUSSION.

DR. A. H. THOMPSON, of Topeka, Kansas. There has been such a limited amount of observation and record in regard to this complicated subject that very little can be said about the laws that may govern correlated variation, and nothing can be said as to the real law. Darwin was perhaps the first to notice the variation and abnormality of teeth and hair together. Of course the teeth and hair, both being dermal structures, are liable to be varied together, where there is any abnormality of dermal development, whether pathological or not. There is something peculiar about that to which Dr. Guilford has referred. While we call teeth dermal structures, we know they are not entirely so. The dentine is certainly an osseous structure; so that it is quite a question whether we are justified in calling the teeth, as a whole, dermal structures. I had a case once in which some of the teeth were absent, but there was very little variation in the hair except that the man was almost beardless. Cases of that sort would be valuable contributions to the subject.

DR. W. XAVIER SUDDUTH, of Minneapolis. Apropos of this subject, I have one case of an individual who came under my notice several years ago, where there was a lack of development of the sudorific glands. The temporary teeth also were quite faulty as to form and quality. There was almost entire absence of hair over the greater portion of the body, and that on the scalp was very sparse and of poor quality. Strange to say, however, the permanent teeth were well developed, normal as to number and quality. This case evidently was one where the fault lay in some nutritive disturbance about the sixth week of intra-uterine life, when the hair and teeth begin their development; the individual after arriving at maturity had overcome this disturbance

Digitized by Google

and developed a second set of teeth normally. The case was plainly one of nutritive disturbance at that time. We have not enough cases on record to formulate any law regarding this peculiar phase of abnormal development. There is no regularity in the disturbance of the hair and teeth. In some of the cases cited the teeth were fairly normal and the hair was abnormal; in others the hair was normal and the teeth abnormal. There can be no question about the homologous relation between the hair and the teeth. I think that there was a time in the history of the evolution of the teeth when they were not as perfect as at present, when they could have been classified more nearly as scales or dermal appendages.

DR. FRANK ABBOTT, of New York. I do not understand that the teeth as such are of dermal epithelial production. It is the enamel of the tooth that is of epithelial production, the other portions being of a different structure and from a different source. What will affect the development of the enamel of the tooth, may readily affect the development of the hair follicles, the epithelial portion of the hair and the teeth being affected simultaneously. Defective enamel in a tooth is produced by some disease of the epithelium, affecting the enamel organ, and causing deterioration or cessation in the production of enamel. Millions of hair-follicles may be affected by the same disturbance or a different one. If we always found people having no hair and without teeth, we could say one cause produced both conditions; but we find persons with diseases of the mouth affecting the development of the teeth, and no disease of the scalp or any portion of the body to affect the development of the hair, and *vice versa*. No doubt all variations of this kind are due to dermal disturbances during the intrauterine period, as in the instance referred to, the mouth in which is wonderfully developed for a person who never had any teeth. I have a patient now who has seven teeth in one jaw and six in the other, and there never have been any incisors in her mouth.

DR. A. H. THOMPSON, of Topeka, Kansas. In the lower

Digitized by Google

animals the teeth are entirely osseous, and quite identical with the bones of the skeleton and jaw. As we advance in the scale of development, the enamel is added to the osseous structure or dentine.

DR. W. X. SUDDUTH, of Minneapolis. In the development of teeth the development of the enamel organ must invariably precede the osseous. The history of the teeth and the hair is identical, both beginning at the same time—the sixth week of intra-uterine life. The epithelial buds must be there both for the hair and the teeth.

The following paper was then read:

TEETH OF THE LOWER JAW AT BIRTH.

BY FRANK ABBOTT, M.D., NEW YORK.

It will be remembered that Heitzmann and Bödecker in their "Contributions to the History of the Development of Teeth," * brought their researches up to the ninth month of fœtal life. I have followed these studies up to the time of birth, in order to ascertain at this period the progress of development of the temporary, as well as the permanent, teeth during the last month of fœtal life, the results of which I present for your consideration. Two lower jaws of apparently well developed new-born babes were excised soon after death; stripped of their soft tissue and placed for preservation into alcohol. Afterward they were placed in a half of one per cent. solution of chromic acid, for the purpose of decalcifying the hard tissues, and at the same time, to preserve the soft structures. I call attention especially to this method since it has proven, in our hands, to be the safest for the preservation of the teeth.

Previous descriptions of developing teeth have been questioned in Germany on the ground that the preservation of the tissues was not thoroughly done. After repeated renewals of the chromic acid solution the jaws were supposed to have become soft enough to be cut with a razor; but it was found that the central portions, after they had been cut

* Independent Practitioner, Vols. VII-IX.

Digitized by Google

up into blocks, were still hard, and had to be again immersed in the chromic acid solution, for the completion of the decalcification. The blocks had been obtained from the right half of each of the jaws and were cut radiatingly in order to obtain antero-posterior vertical sections. The blocks were imbedded in celloidin, sliced into thin sections, and each section numbered with the utmost care, in order to keep the succession of the teeth unbroken. Thus the sections could be examined and those selected for mounting which contained teeth or features belonging to the process of the development of teeth. The sum total of the sections thus obtained was one hundred and twenty-five. Out of these, again, only those were selected for study and drawing which showed the teeth in greatest perfection, the most central sections being selected for drawing.

Before entering into the description of the teeth, I wish to say that one of the jaw bones, under the microscope, was found to be slightly rachitic, as proven by some scanty islands of hyaline cartilage found in the bone tissue, though the baby was to all appearance normal. Previous observations have established the fact that congenital rachitis is first shown under the microscope by a retardation of development of bone tissue in the lower jaw, before any abnormal symptoms appear to the naked eye either on the skull or shaft bones. It is evident that in this case the rachitic process has caused a slight delay in the formation of dentine and enamel. This assertion is clearly established by a comparison with the sections obtained from the second jaw in which there was not the slightest symptom of rachitis. The best specimens, however, and most of the drawings, were obtained from the first jaw, the slight deficiency in the deposition of lime salts enabled me to obtain nearly perfect sections, whereas nearly all of the sections of the second jaw were torn and very imperfect.

Another difficulty arose; as before stated, all the sections were made in an antero-posterior vertical direction. Some of the temporary, and most of the permanent front teeth, are, as is well known, irregular or devious within the

Digitized by Google

jaw, so much so that the direction of the sections do not always fully comply with the expression; consequently some of the drawings may not correspond to the greatest height or designed diameter of the tooth illustrated.

The first tooth met with was, of course, the CENTRAL INCISOR (see Fig. 1). The papilla of this tooth exhibited a

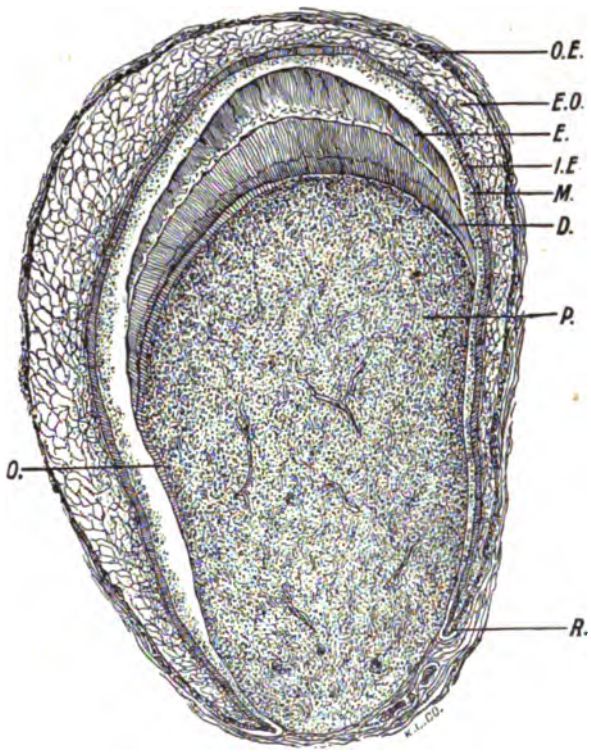


FIG. I. CENTRAL TEMPORARY INCISOR.

E. Enamel cap. D. Dentine cap. I. E. Inner epithelium, ameloblasts. M. Medullary layer, from which enamel forms. E. O. Enamel organ. O. E. Outer epithelium broken up. P. Papilla. O. Row of odontoblasts. R. Recurvation of inner into outer epithelium.

bluntly ovoid shape, with a somewhat broader top and slightly tapering to the lower end. As a matter of course, the whole papilla, at this stage, is destined for the production of the crown of the tooth only, and there is no trace yet present of the future root.

Digitized by Google

The papilla is composed of a myxo-fibrous connective tissue, throughout its main bulk, and is scantily supplied with capillary blood vessels. The periphery of the papilla shows a row of odontoblasts, only at the labial aspect, and not entirely here, even, since the lowest third of the papilla lacks in this respect. Here, and on half of the summit, as well as along the whole lingual aspect, the surface of the papilla exhibits a myxomatous medullary tissue, without an admixture of delicate bundles of fibrous connective tissue, with which the rest of the papilla is abundantly supplied. The summit of the papilla is coated with a dentine and enamel cap, the former being in its diameter slightly in excess of that of the latter. The dentine cap is further advanced in development on the labial than on the lingual aspect; it exhibits a non-calcified portion nearest the papilla, which has assumed a deep stain from the carmine; whereas, the calcified portion remained unstained.

The border line between the two is marked by the well-known globular deposits of lime-salts. The enamel cap, of a greenish brown color (due to the chromic acid), stops short of the dentine cap, and is, at its peripheral portion, made up of regularly developed prisms. The inner epithelium from which arise the ameloblasts, produces a perfect row all around the papilla, with the exception of the apex. The place of recurvation to the outer epithelium, which latter is considerably broken up at this stage of development, is noticeably deeper on the labial than on the lingual aspect. The space between the inner epithelium and the already formed tooth is produced by a detachment of the former from the latter, and plainly shows a layer of protoplasmic bodies, into which the ameloblasts have retrogressed before becoming infiltrated with lime-salts. Since this feature is pronounced, in all the teeth of the jaws under consideration, the specimens are of great value in assisting, at least, in settling the still mooted question as to the mode of development of enamel. I propose to dwell more fully upon this topic, after the description of the cuspid tooth.

The CENTRAL PERMANENT INCISOR (see Fig. 2) is a

Digitized by Google

formation with a considerably broader papilla, but a less developed enamel and dentine cap, than the corresponding temporary tooth. The papilla is made up exclusively of medullary tissue, supplied with scanty blood-vessels, none of which could be seen in the specimen from which the illustration was taken. Both the inner and outer epithelium

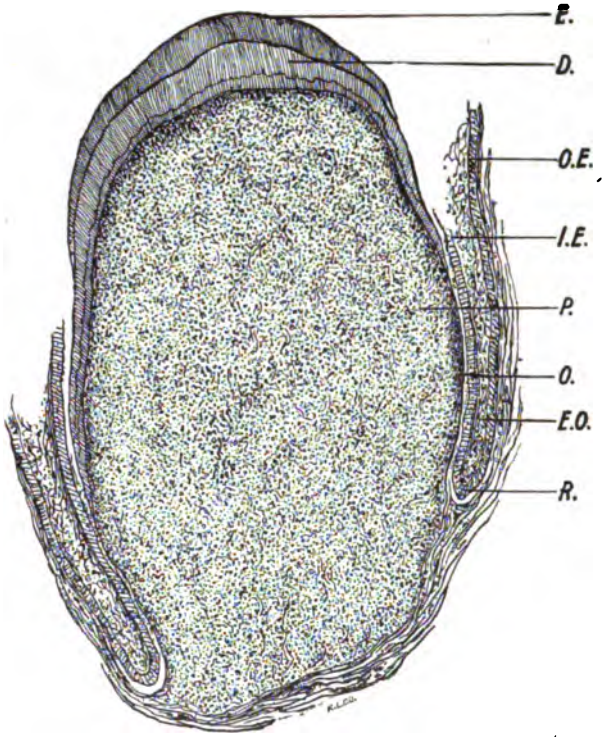


FIG. II. CENTRAL PERMANENT INCISOR.
E. Enamel cap. D. Dentine cap. I. E. Inner epithelium. E. O. Enamel organ. O. E. Outer epithelium. P. Papilla. R. Recurvation of inner into outer epithelium. O. Medullary tissue forming odontoblasts.

were plainly visible. The enamel organ is much less advanced in the formation of myxomatous tissue, especially at the point of recurvation of the epithelia, than in the temporary tooth.

The LATERAL TEMPORARY INCISOR (see Fig. 3) has a papilla much longer than that of the central; at the same

Digitized by Google

time it is of a more cylindrical form, otherwise of a structure identical in all respects. On the top of the papilla, we notice a rounding labial, and a sharply pronounced angle at

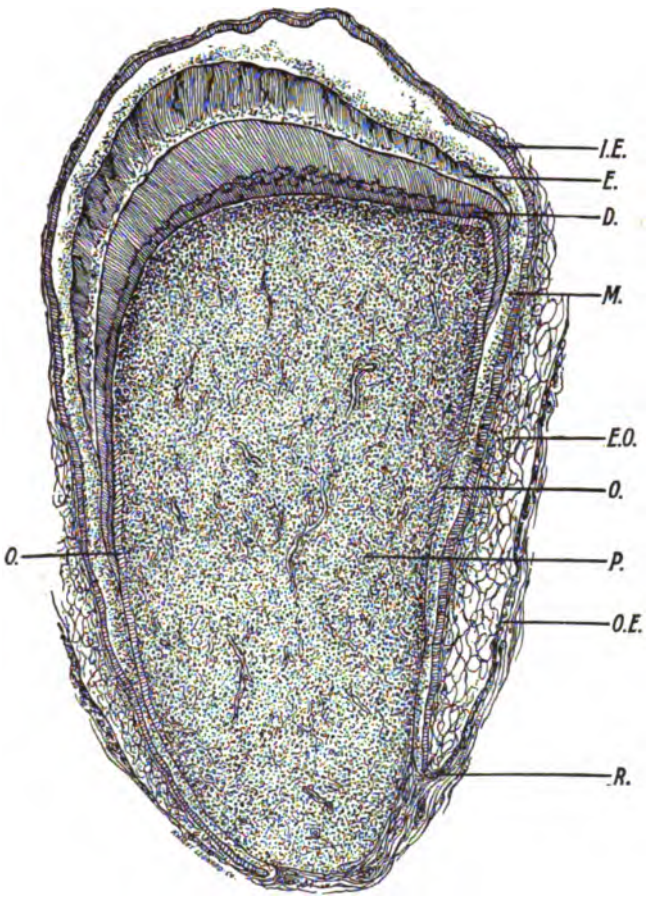


FIG. III. LATERAL TEMPORARY INCISOR.

E. Enamel cap. D. Dentine cap. I. E. Inner epithelium, ameloblasts. M. Medullary layer, from which enamel forms. E. O. Enamel organ. O. E. Outer epithelium broken up. P. Papilla. O. O. Rows of odontoblasts. R. Recurvation of inner into outer epithelium.

the lingual portion. We observe a row of odontoblasts only at the central portion of the labial surface, at the summit, and the upper two-thirds of the lingual aspect, while the rest of the surface is occupied by a medullary tissue, desti-

Digitized by Google

tute of fibrous elements, the same as in the central incisor. The dentine cap is considerably broader than that of the central incisor, and extends further down upon the labial surface. It of course forms a decided angle at the lingual

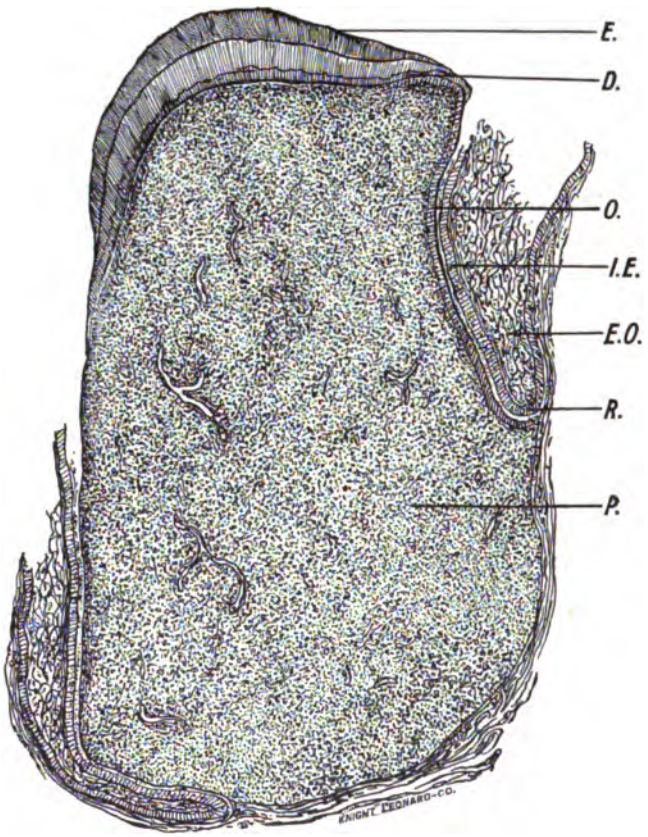


FIG. IV. LATERAL PERMANENT INCISOR.

E. Enamel cap. D. Dentine cap. I. E. Inner epithelium. E. O. Enamel organ. R. Recurvation of inner into outer epithelium. O. Rows of odontoblasts. P. Papilla.

portion of the top of the tooth. The border line between the non-calcified and calcified portions of the dentine is more conspicuous, by the presence of globular deposits of lime-salts, than in the central incisor. The enamel cap is of about the breadth of that of the central, and strictly follows

Digitized by Google

in its general contour, the dentine cap. A pronounced feature in this tooth is the medullary tissue occupying the space between the row of ameloblasts and the surface of the tooth. The myxomatous enamel organ in both temporary incisors does not show a well developed reticulum, but in its stead a finely granular protoplasmic mass, obviously a stage of development of the myxomatous reticulum in progressive formation.

The LATERAL PERMANENT INCISOR (see Fig. 4) has an oblong papilla, notable for the abrupt stopping of the enamel and dentine caps at the lingual aspect, and also for the precipitous lingual portion of its upper one-half. The blood-vessels are comparatively few in number, traversing the medullary tissue of the papilla. A fully developed row of odontoblasts is to be seen only at the lingual and posterior cutting edge, the rest of the cutting edge is mostly destitute of these bodies. The rest of the papillary surface shows only rows of medullary corpuscles tending toward the formation of odontoblasts. A conspicuous feature in this specimen is the difference between the points of recurvation of the epithelia, which at the labial aspect embraces quite a portion of the bottom of the papilla; while at the lingual, it barely reaches down one-half its length.

The TEMPORARY CUSPID (see Fig. 5) has a papilla which, it will be observed, is somewhat triangular in shape, with a sharply pointed apex, and irregularly rounded at the base; with the lingual portion extending down slightly beyond the labial. The structure of the papilla does not materially differ from that of the incisors, the amount of capillaries also being about the same. A row of odontoblasts is observable only at the lower portions of the surface of the tooth on the labial and lingual aspects. The summit is occupied by a well pronounced myxomatous, the rest of the surface by a medullary tissue. The dentine cap is very broad, and sharply pointed at its summit. It extends far down along the surfaces of the papilla, more so anteriorly than posteriorly. The non-calcified portion is decidedly narrower, and the globular boundary line less pronounced,

Digitized by Google

than in the incisors. The enamel cap is likewise very broad, stopping short of the dentine cap, and is regularly developed in every respect.

The sections obtained from the cuspid were so perfect that they could advantageously be utilized to assist in set-

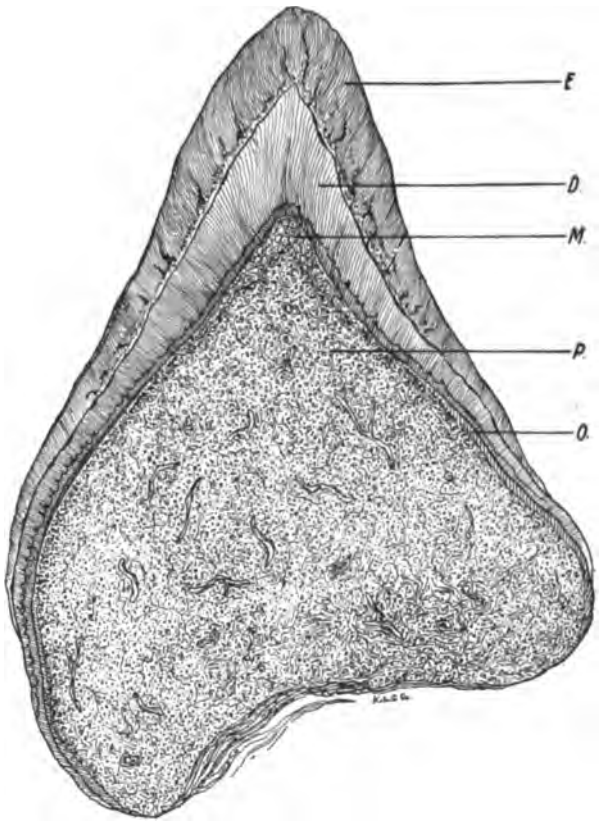


FIG. V. TEMPORARY CUSPID.
E. Enamel cap. D. Dentine cap. M. Myxomatous tissue. P. Papilla. O. Row of odontoblasts.

tling certain mooted questions as to the development of dentine and enamel. In the first place, the odontoblasts have, since their discovery, been considered by the majority of histologists as the dentine formers proper.

It was Heitzmann and Bödecker, in their above quoted

Digitized by Google

article, who first denied the direct transformation of odontoblasts into dentine, but claimed that they are first broken up into medullary corpuscles at their distal ends, which become infiltrated, first, with a glue yielding basis-substance, and afterward with lime-salts, and that the offshoots of the original odontoblasts, being the dentinal fibrillæ, run between the calcified medullary corpuscles, in their respective canaliculi. Every odontoblast sends off one or more fibrillæ. This fact, with some observers, renders the formation of the basis substance not clearly understood. So great indeed has been the difficulty that E. Klein, of London, and R. R. Andrews, of Cambridge, have resorted to specific fibre-cells for the production of these fibrillæ, whilst the odontoblasts proper produce the basis-substance.

This view was met at the time by a demonstration, showing that the "fibre-cells" were wedge-shaped odontoblasts, and most numerous where the odontoblasts are arranged in a sharply curved line, especially at the summit of the papilla. In the pig's fœtus, for instance, the summit of the papilla is occupied almost exclusively by such narrow and wedge-shaped odontoblasts. The difficulty is, however, easily overcome by the demonstration of medullary corpuscles at the periphery of the papilla, *directly beneath the already formed dentine.* In my specimens, especially the cuspid, one is struck by the scantiness of rows of odontoblasts, and the presence of medullary elements in their stead; one row being visible on a portion of the labial, another on a portion of the lingual surfaces only. Not infrequently the odontoblasts are arranged at acute angles to the dentinal canaliculi. (See Fig. 5.) This feature possibly may be attributable to the hardening process and the subsequent disfigurement by shrinkage, although good reasons may be adduced to the contrary, as the specimens are so perfect in all other respects. The greater area of the surface of the papilla is occupied by a medullary tissue, claimed to be the dentine builder proper. In our cuspid the summit is occupied by a myxomatous tissue, approaching in gracefulness almost that of the enamel organ. (See Fig. 6.) Between

Digitized by Google

this myxomatous tissue and the border of the non-calcified dentine, clusters of indifferent or medullary corpuscles are seen, arranged longitudinally along the surface of the papilla, therefore not as yet arranged for the formation of

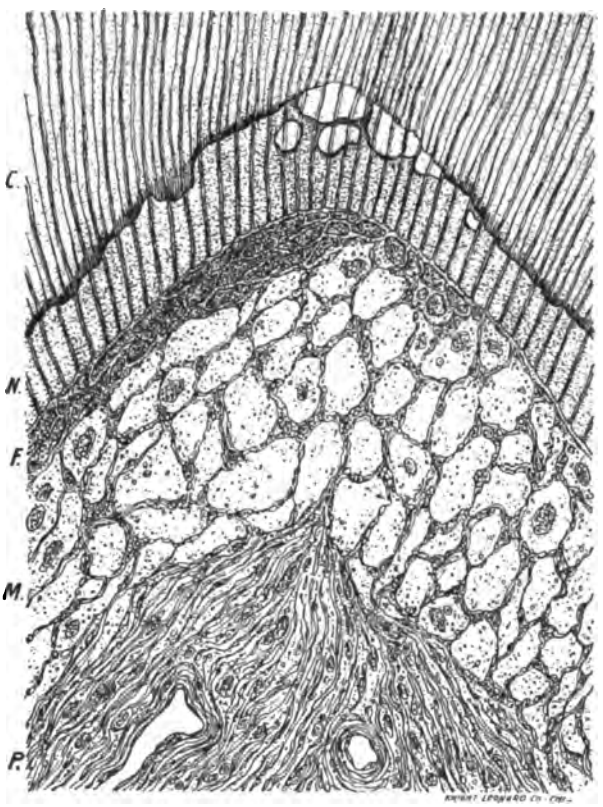


FIG. VI. SUMMIT OF PAPILLA OF TEMPORARY CUSPID.

C. Calcified dentine. N. Non-calcified dentine, globular deposits of lime-salts at the border between calcified and non-calcified dentine. F. Flattened out indifferent or medullary tissue. M. Myxomatous tissue. P. Mixo-fibrous tissue of papilla with capillary blood vessels.

dentine. Beneath the myxomatous tissue we find vascularized myxo-fibrous tissue, constituting the main bulk of the papilla. Professor Ebner, of Vienna, in the "German Hand Book of Dentistry," 1891, by J. Scheff, Jr., claims that we have interpreted poorly preserved specimens, when we

Digitized by Google

speak of medullary corpuscles as the dentine formers. In view of this assertion, I will draw the gentleman's attention to these illustrations taken from perfect specimens, and ask him how he can account for the absence of odontoblasts

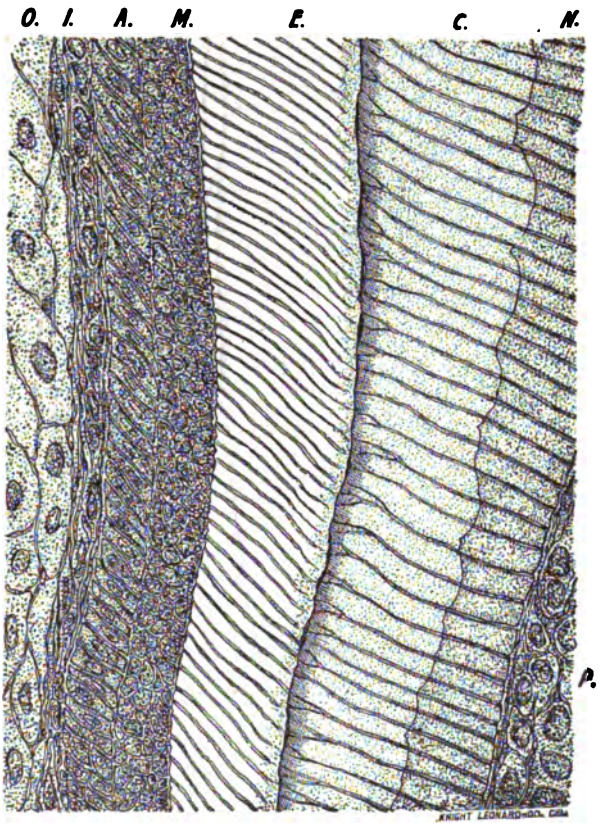


FIG. VII. LATERAL PORTION OF TEMPORARY CUSPID.

O. Enamel organ. I. Intermediate layer. A. Row of ameloblasts. M. Medullary tissue. E. Enamel. C. Calcified dentine. N. Non-calcified dentine. P. Papilla.

and in their stead medullary tissue? Obviously, there is a series of tissue changes preceding the appearance of dentine, and one of the links in the chain is the odontoblast. At the lateral portion of the cuspid the question of the formation of enamel may possibly be settled. (See Fig. 7.)

Digitized by Google

Between the fully developed enamel and the row of ameloblasts there is a broad layer of medullary tissue, considerably broader indeed than in any specimen of developing human teeth I have ever seen before. Ebner militates against the view "*that the ameloblasts are not direct enamel formers, but only transient formations, originating from a coalescence of medullary corpuscles, and breaking up again into such corpuscles before the appearance of enamel tissue.*" Can he or any one explain, may I ask, the composition of enamel prisms, of square or many sided blocklets (admitted by all observers), except by the construction of each enamel rod, by a succession of medullary corpuscles, infiltrated with lime salts?

It is unnecessary for me to state here that I seriously object to the assertion of Ebner, or any one else, that our specimens were or are imperfect. The greatest care having been taken in their preparation, I can vouch for their perfection. With equal propriety I might ask the learned professor why it is that his specimens were so imperfect as to not show the fibre between the enamel prisms, nor the medullary tissue between the ameloblasts proper and the formed enamel.

The PERMANENT CUSPID (see Fig. 8) has a papilla considerably broader than that of the temporary, so much so that it could be illustrated entirely only with a power of twenty-five diameters. The labial aspect is far more bulky than the lingual; the former being precipitous, the latter more tapering. It is composed of medullary, without the slightest admixture of myxo-fibrous, or fibrous connective tissue, at the same time being poorly supplied with blood vessels. Both the dentine and enamel caps are as yet narrow, terminating upon the labial side abruptly, an apparent stricture presenting at their termination, beyond which the papilla bulges considerably; while on the lingual side, the dentine and enamel caps follow the unbroken line of the papilla.

FIRST TEMPORARY MOLAR (see Fig. 9) at this stage of development is of considerable size and importance. It presents in this section, two cusps, of which the lingual is

Digitized by Google

quite noticeably higher than the buccal; although the latter is but little less developed than the former. The papilla is a bulky mass of myxo-fibrous connective tissue, abundantly

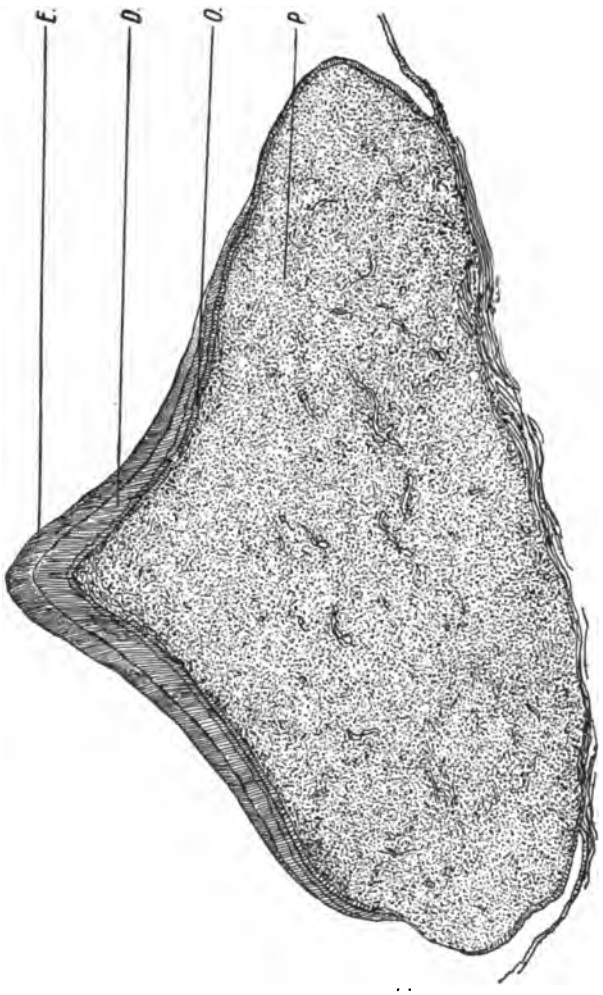


FIG. VIII. PERMANENT CUSPID.
E. Enamel cap. D. Dentine cap. O. Row of odontoblasts. P. Papilla.

supplied with capillary blood-vessels. Corresponding to the valley between the two cusps, the papilla is narrowest, bulging from this point upward and outward. The summit of the papilla of the lingual cusp, is higher and more pointed

Digitized by Google

than that of the buccal. The papilla exhibits a row of odontoblasts, only at the lower third of the lingual aspect; everywhere else, its surface is made up of medullary tissue,

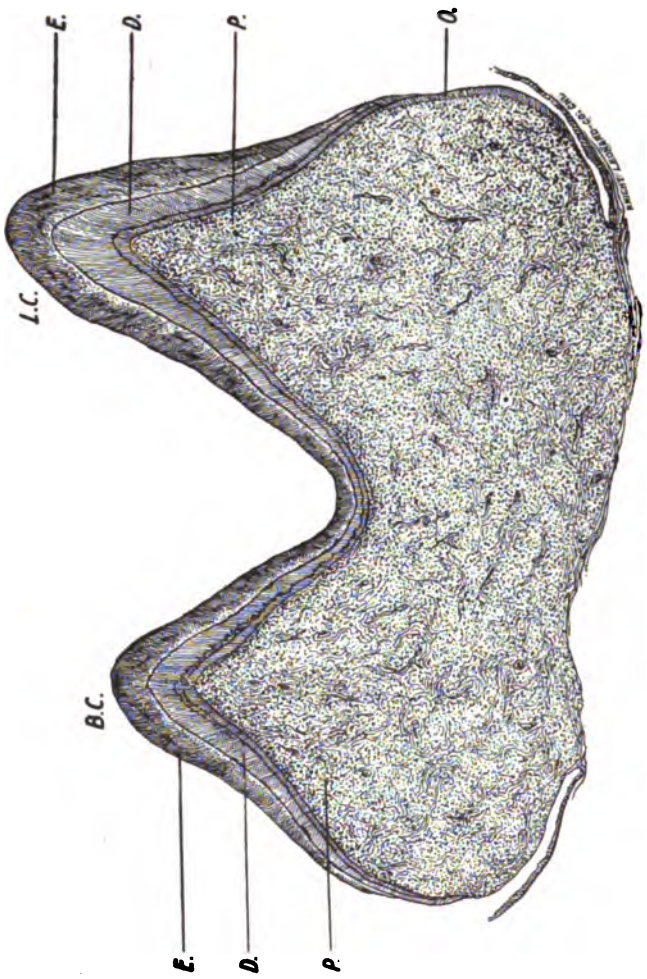


FIG. IX. FIRST TEMPORARY MOLAR.
B. C. Buccal cusps. L. C. Lingual cusps. E. E. Enamel cap. D. D. Dentine cap. P. P. Papilla.
O. Row of odontoblasts.

without a trace of odontoblasts. The summit of the papilla of the lingual cusp exhibits a zone of myxomatous tissue similar to that described in the papilla of the cuspid. The dentine cap forms a continuous investment around the cusps,

Digitized by Google

being narrow in the valley between them, and slanting toward the base of the papilla, reaching further downward upon the buccal than upon the lingual side. It is fully developed, and composed of a narrow non-calcified, and a broad calcified layer, the border line between the two por-

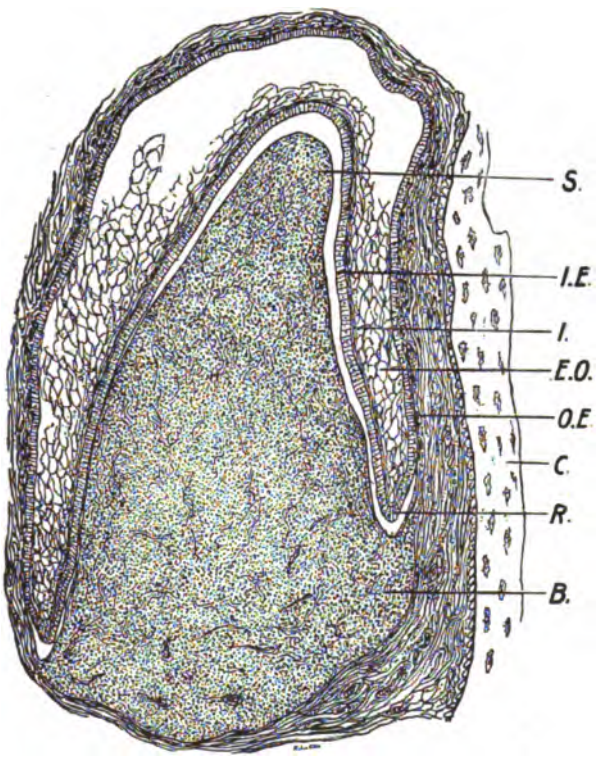


FIG. X. FIRST PERMANENT BICUSPID.

S. Summit of papilla. B. Base of papilla. I. E. Inner epithelium. O. E. Outer epithelium. E. O. Enamel organ. I. Intermediate layer. C. Cancellous bone lined by osteoblasts. R. Recurvation of inner into outer epithelium.

tions being more globular in the buccal than in the lingual cusp. The enamel is likewise continuous, fully developed, and calcified, being a trifle broader at the summit of the lingual than at that of the buccal cusp. In the valley between the cusps, it appears somewhat broader than the layer of dentine.

Digitized by Google

The FIRST PERMANENT BICUSPID (see Fig. 10), the product of the bud from the first temporary molar, at birth corresponds to a temporary tooth four and a half months old. It is cone-shaped and composed of medullary tissue, with but scanty capillary blood vessels at the base of the cone. As a matter of course, there is not even a trace of odontoblasts visible. The papilla is covered with a layer of columnar epithelium, the so-called inner epithelium of the enamel organ, not as yet transformed into ameloblasts.

The point of recurvation of the inner into the outer epithelium is deeper down upon the buccal than upon the lingual aspect of the papilla. The outer epithelium is still recognizable as being composed of short columnar epithelium, surrounded by fibrous connective tissue. Between the inner and the outer epithelium there is a well developed myxomatous reticulum, *the enamel organ.* The intermediate layer is present, though as yet little pronounced. In the specimen from which the figure is taken the upper portion of the enamel organ is torn and partly missing.

The SECOND TEMPORARY MOLAR (see Fig. 11) has in our specimen two well-developed cusps, of which the lingual far surpasses in size the buccal. This will, as a matter of course, not show the relation between the two cusps with certainty; since it is quite possible that the lingual cusp was caught by the knife at its center, therefore, at its greatest height, while the buccal cusp may have been taken in a more peripheral portion, and thus appear smaller than it really is. Between the two cusps there is an elevation covered only by dentine, which likewise may represent a cusp cut near its periphery. The papilla is plainly myxo-fibrous connective tissue, and freely supplied with blood vessels. Rows of odontoblasts are seen only at a small portion of its periphery. The height of the papilla is three times greater at the lingual than at the buccal portion. A striking feature is the sharp boundary line at the lingual aspect, between the papilla, covered with dentine, and that without it, and the bulging out of the latter. The dentine cap is present all over the upper surface of the papilla, somewhat broader at the sum-

Digitized by Google

mit of the lingual cusp than on the summit of the buccal one. It is a trifle broader at the height of the central elevation than in the valleys either side of it.

FIG. XI. SECOND TEMPORARY MOLAR.

B. C. Buccal cusps. L. C. Lingual cusp. E. E. Enamel cap. D. D. Dentine cap. P. P. Papilla. O. O. Row of odontoblasts.

The difference between the calcified and the non-calcified portions of the dentine is quite marked. There are two enamel caps, formed one over each, the lingual and the buccal cusp; the former being almost twice the breadth of the latter.

Digitized by Google

The SECOND PERMANENT BICUSPID (see Fig. 12) is still younger in its development; it corresponds to a temporary tooth in the fourth month of embryonal life. The papilla is a blunt cone divided into a conical upper portion, surrounded by the inner epithelium, and a broad base surrounded by fibrous connective tissue. The papilla is made

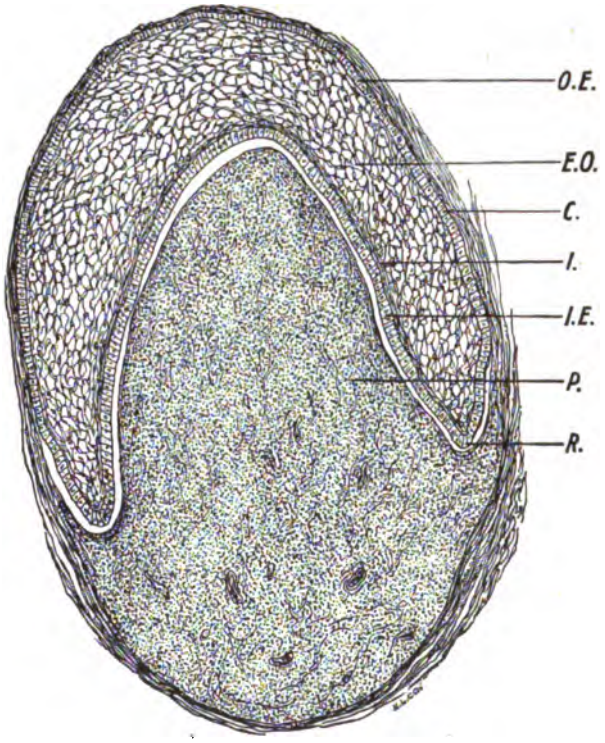


FIG. XII. SECOND PERMANENT BICUSPID.

P. Papilla. I. E. Inner epithelium. O. E. Outer epithelium. R. Recurvation of inner into outer epithelium. E. O. Enamel organ. I. Intermediate layer. C. Fibrous connective tissue.

up altogether of medullary tissue and shows blood-vessels at its base in small numbers. The inner epithelium is quite conspicuous by the columnar shape of its constituent elements. The same elements also produce the row of outer epithelium, which appear shortened only at the summit of the enamel organ. The enamel organ itself is not as yet fully

Digitized by Google

developed, its points of intersection being large, the meshes, on the contrary, narrow. The intermediate layer is but little

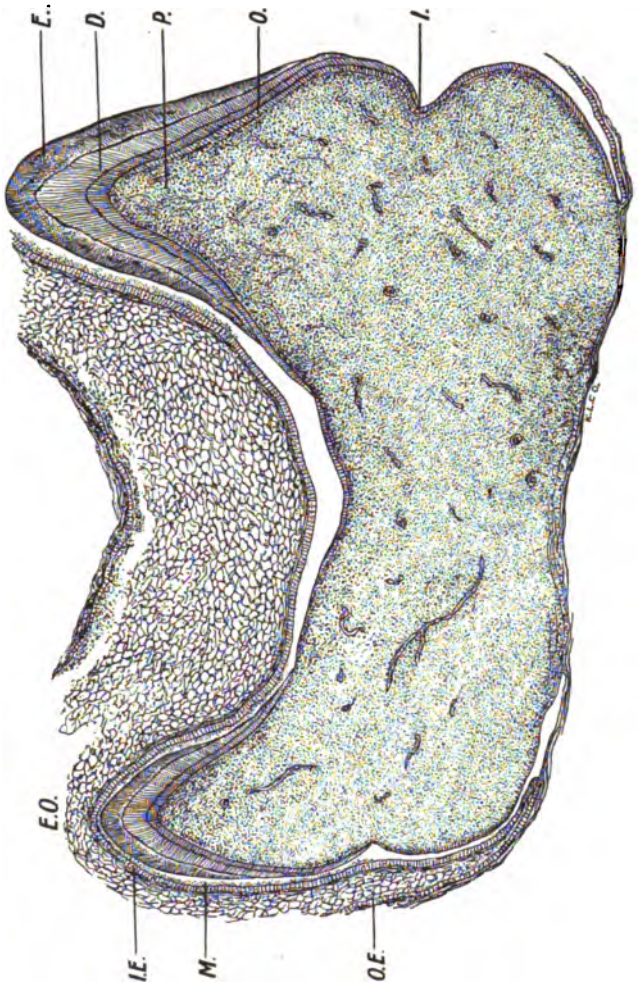


FIG. XIII. FIRST PERMANENT MOLAR.

E. Enamel cap. D. Dentine cap. I. Depression on surface of papilla. P. Papilla. O. Row of odontoblasts. I. E. Inner epithelium. O. E. Outer epithelium. E. O. Enamel organ. M. Medullary tissue.

pronounced. In this specimen, the enamel organ was unbroken.

The FIRST PERMANENT MOLAR is an unusually well developed tooth in our series (see Fig. 13). It has two well pronounced cusps, the largest being the lingual. The pa-

Digitized by Google

pilla is composed mainly of myxomatous and medullary tissue, with an admixture of some delicate fibrous connective tissue. Its vascular supply is as yet scanty. It shows deep incisions on both the lingual and buccal aspects, corresponding to the termination of the dentine caps, beneath which the papilla bulges quite noticeably. Rows of odontoblasts are seen along the greater extent of the surface of the papilla, especially is this the case upon the lingual aspect, which shows an uninterrupted row of these formations. . A second row is seen in the valley between the two cusps, where there is as yet no dentine formed. There are separate dentine caps for each cusp, that over the lingual cusp being especially well developed.

The enamel caps are, as is the rule in all developing teeth, shorter than the dentine caps; that of the lingual cusp being at its summit twice as thick as that upon the buccal. The row of inner epithelia is transformed into ameloblasts over both cusps, and there is a distinct layer of medullary tissue present between the ameloblasts and the fully developed enamel. The outer epithelium begins to break up at its upper portion, where the enamel organ forms a broad layer of myxomatous tissue.

Huxley,* as early as 1853, says, when speaking of the development of dentine, "That it is not explicable by the cell theory." How true this statement, made so many years ago. We do not, however, agree with his assertion, that the pulp tissue takes no part in the formation of dentine. Any one considering the so-called cells as stable and unchangeable formations, will be at loss to explain the formation of any tissue of the teeth. The latest researches in histology have proven that, as far as the morphological elements are concerned, there is nothing stable during the advancing formation of the organism and its constituent parts; nor during full development, at the height of life; and far less is this the case during its decline. Before a tissue is fully formed there are repeated oscillations forward and backward, in the appearance of morphological elements; the intervening

* Quarterly Journal of Microscopical Science, 1853.

Digitized by Google

stage invariable being their reduction into the stage of indifferent, medullary or embryonal tissue. It has been proven that the papilla of the developing teeth may proceed to the formation of the myxomatous, say myxo-fibrous connective tissue. At its periphery this tissue, sprung from medullary corpuscles, falls back to medullary corpuscles, which unite into large branching protoplasmic bodies, resembling columnar epithelia: the so-called odontoblasts. These are by no means the dentine producers proper; no more so than that osteoblasts are the real bone formers. Both these formations are nothing but a pre-stage toward the formation of either dentinal or bone tissue. Odontoblasts break up once more into medullary corpuscles, from which at last, by their infiltration with basis-substance and immediate deposition of lime-salt, are first non-calcified, and at last calcified dentine is produced. The zigzag line of development of dentine, therefore, is first embryonal or medullary tissue; second, myxomatous or myxo-fibrous tissue; third, embryonal or medullary tissue; fourth, odontoblasts; fifth, again embryonal or medullary tissue; and sixthly and lastly, non-calcified dentine.

Every reduction to embryonal tissue is followed by a step in advance in the development of the organ, until at last the most perfect tissue, such as dentine, will make its appearance. It is a question in my mind, whether the dentine, as we see it at the time of birth, is a lasting formation, or the same as we see it in the fully grown temporary or permanent tooth. The size of the papilla and the dentine cap are, at birth, far too small in comparison with what we see at the time of eruption. It is quite possible, therefore, that the first formed dentine cap is not lasting, and may eventually be reduced once more into medullary tissue, before the permanent breadth of dentine corresponding to the transverse diameter of a fully formed tooth is reached. Similar oscillations must, of necessity, take place in the production of the pulp, and the dentine of the roots. At the time of birth, only the papilla of the crown is present, sharply bordered downward by fibrous connective tissue. This latter

Digitized by Google

tissue is reduced to its embryonal condition in order to produce the necessary material for the production of the dentine of roots. Future observations will be required in order to settle the question as to how the dentine and cementum of the roots are formed.

The same puzzles, we meet with, in the history of development of the enamel. At the time of birth, the myxomatous enamel organ is far too small to enable us to understand the formation of a broad enamel layer, such as we see at the time of eruption. Even the first established enamel caps are far too small in comparison with the diameter of the crowns of either temporary or permanent teeth. Heitzmann and Bödecker in their above quoted publication, the result of eight years hard labor, came to the conclusion that the elements of the original epithelial pegs are reduced to medullary tissue, afterward to fibrous connective tissue, next to medullary tissue, and eventually, to ameloblasts. Ameloblasts, according to their notion, are not direct enamel formers, no more so than odontoblasts are direct dentine formers. The ameloblasts are reduced to medullary corpuscles, which after infiltration with the basis-substance and immediate deposition of lime-salts, at last produces enamel prisms.

From a study of their specimens and my own, I am convinced that these views are correct.

Should the first appearing enamel cap prove too small for a full grown tooth, nothing is left to solve the puzzle of development but the assumption that even the fœtal enamel cap is not lasting, and must undergo reduction, or possibly repeated reductions to medullary tissue, before it reaches the extent of a fully developed tooth, such as we see at the time of eruption.

DISCUSSION.

DR. R. R. ANDREWS, of Cambridge, Mass. A tooth calcifies, I understand it, by the salts of lime in the first form of minute globules of various sizes being given out from the cell in clusters, which coalesce and form larger masses

Digitized by Google

through a substance not calcified, marked between the two dark lines on the drawing shown you. They adhere to the tissue already fully calcified, from a layer, and by a chemical process are fully calcified and form another layer. They are masses of calco-globulin, not cells in any sense of the word. This tissue, which is marked full of minute spots, as I may call them, has no spots under the microscope. It looks like a mass of what we call lime-salts. It is perfectly clear, and has none of these little granules which the pen has given on this drawing. What the paper calls medullary corpuscles are simply calco-spherites, passing through the cells, coalescing and forming larger masses which shall finally blend into a whole layer, which by a process of further calcification shall make the same tissue we see here.

DR. W. X. SUDDUTH, of Minneapolis, Minn. This subject has been gone over for years, and I do not think we will ever be able to come to an understanding of the true interpretation of the phenomena. I do not see that we are any nearer than we were in 1885, when we first began to discuss this subject. The essayist has taken up a line of work that has not heretofore received thorough consideration—that is, a serial line of study of the human teeth at birth, commencing at the central incisor. I cannot agree with Dr. Abbott in his method of presenting the subject. Give a man his own premise, and he surely ought to be able to prove his position. To discuss Dr. Abbott's paper from the drawings he presents, is equal to giving him his premise. I never have been able to put any interpretation upon the bodies referred to by Dr. Abbott as medullary tissue, lying between the ameloblasts and the fully-formed enamel. Dr. Andrews has presented that in the correct way.

I have a serial line of preparations here, taking this subject from the very beginning, through to the fully calcified tooth, at about the fifth year. Some of them are slides and some are permanent preparations, where the cell-tissues have been taken out and the teeth kept *in situ*, and I think I can demonstrate that there is a progressive development until the permanent teeth are developed. I have never seen any

Digitized by Google

indication that the enamel-cap recedes and is lost. The point that it is to small to represent the crown of the permanent tooth is not well taken, because it represents simply the apex of the tooth, and the expansion is lateral and the development downward, and you can get just as much thickness as there is space to develop in. The temporary tooth illustrates the point better. The tubules run down vertically over the surface of the papillæ. The columns stand at right angles to the surface of the papillæ. These would come down so as to bring increased thickness at the apex of the tooth. In the development of secondary dentine, you can fill in the apex of the pulp and get an increased thickness of dentine over the surface.

DR. A. H. THOMPSON, of Topeka, Kansas. I desire to congratulate the writer of the paper, but in microscopical work the technics are at fault, producing appearances which are interpreted differently by various students and writers. A great deal of interpretation ought therefore to be made as provisional, until such time as the observer is enabled to see it more as it should appear. Very often the tissues are disturbed and destroyed almost by the processes which are used in microscopical investigation, so that many appearances are produced by faulty manipulation and faulty diagnosis.

DR. ANDREWS. That point is a very good one. Much of the tissue is so shrunken that you do not get the original form. Investigations should commence while the tissue is still warm, before it gets a chance to dry.

DR. ABBOTT. While every one tries to study tissue as Nature built it as near as possible, it is a fact that men do not agree as to its formation. Hardly any two think alike. If they did, there would be no progress, and all investigation would end. Dr. Sudduth and Dr. Andrews think differently from myself, and we are constantly sparring in a friendly way. We all try to be as careful as possible in what we do, and the dental public gets the benefit of our study and investigation. Further discussion, in my judgment, Mr. President, is unnecessary on my part.

Digitized by Google

DR. W. X. SUDDUTH, of Minneapolis, Minn. The pulp-tissue, being highly vascular and resembling embryonic tissue, and in fact being embryonic tissue, and not mature tissue, shrinks a great deal more than mature tissue would. I have taken fresh jaws, and in making an incision on each side of the jaw and leaving out the papillæ on the mucous membrane, I find that they are very much broader at the base than when the tissue had been hardened. That would account for the lack in width.

Adjourned until Thursday afternoon at 2:30 o'clock.

THIRD SESSION.

The Section was called to order, in the absence of the Chairman, at 2:30 P.M., Thursday, August 17th, by Dr. W. X. Sudduth, of Minneapolis, Minn.

The following paper was then read:

THE PEDIGREE OF THE CENTRAL INCISOR.

BY ALTON H. THOMPSON, D.D.S., TOPEKA, KANSAS.

The condition of the upper central incisor in man is something unique, in that in the midst of the general degradation of the human denture, it maintains a high degree of special development. While all the other teeth are reduced in form and degraded in specialization, more or less (or, as in the case of the cuspid in a very great degree), the central has not only preserved its special form and maintained the practice of its function, but has indeed advanced somewhat in the course of the evolution of our species. Indeed, it is rather more highly specialized in man as an effective cutting instrument than in some of the lower forms, through whose ancestors it has passed in the course of its biological history. Of course its form in man is similar to that of the apes below him and of some of the lower monkeys; but the remainder of the teeth of the human denture have degenerated from the completeness of specialization exhibited in those forms, in greater or less degree, while the central incisor has not only maintained its own, but has really advanced.

Digitized by Google

For instance, the lateral incisor, while complete and highly developed in most of the individuals of our race, is very erratic, and is frequently reduced in form and defective in outline, and sometimes is totally absent, thus showing a decided degeneracy in this tooth. This is never exhibited in the central incisor, which always maintains its own complete form. But it is the case, again, with the cuspid, whose great reduction and present rudimentary condition in man is a matter so apparent as to be the subject of common observation, so conspicuous is its extreme reduction. The bicuspids, molars and lower incisors also show the effects of degenerative modification in greater or less degree, but it is very manifest in them also. But the central incisor alone maintains a high degree of completeness and specialization in man, and this fact makes a study of its genetic evolution a matter of peculiar interest.

The function of dividing and cutting food is performed by various organs throughout the animal kingdom, and even teeth for cutting are developed very low in the scale of life. The cephalopods have cutting teeth placed on the odontophore, but these work by a saw-like motion of the organ and are not true incisors. The insects and crustaceans cut by means of the mandibles, and the "pinchers" of the anterior locomotive organs, which are not true teeth. The leech, neresis and other worms have saw-like mandibles which are not properly cutting teeth, but are more like saws or lance blades. In fact the lowest form in which teeth with any approach to the true incisor cutting form are found is the sea-urchin, *echinus*, which has five incisor teeth arranged around a central point, in the remarkable apparatus called "Aristotle's lantern." The points project through the mouth in the centre of the test, and are used with great force to cut shells and rock. The enamel is arranged like that on the teeth of the incisors of the rodents, *i. e.*, it is thick on one side so as to preserve a constantly sharp edge by the wearing away of the tooth on the opposite side. These teeth are set in true alveoli and are worked by powerful muscles. This is the lowest form in which true incisors are found.

Digitized by Google

In the fishes there are no incisors, properly so called, unless we consider as such the cutting teeth of *sargus*, and some other forms of incising denticles which are not implanted in true sockets, for the so-called teeth are anchylosed to the maxillary bones.

None of the reptiles have cutting teeth proper, but all of their teeth are pointed for seizing and holding prey. The beaks of the turtles are analogous to incisors for cutting, but are not homologous with them in origin or structure. The same may be said of the bills and beaks of birds.

Most of the lower mammals are deficient in regard to incisors; the ant-eaters, armadillos, sloths, etc., usually having teeth on the sides of the jaws and these are for grinding purposes only. The kangaroo has large cutting incisors, as it is an exclusive vegetable feeder and requires effective cutting instruments. Others of the marsupialia are variously armed as they may be herbivorous, carnivorous or insectivorous. One, the wombat, has true rodent incisors. In the rodents we find the central incisors developed wonderfully into the long, continuously growing, scalpriform implements used for cutting. The tissues of these remarkable teeth are so arranged as to preserve a continuously sharp edge by unequal wear, as is well known.

In the *herbivora* all of the incisors and also the canines are highly developed for cutting purposes. A curious exception is noted in the ruminants, the most of which have no incisors in the upper jaw, but only a pad of dense and tough cartilage and gum against which the incisors of the lower jaw impinge in cutting off vegetable fibre.

In the carnivorous animals the incisors are much reduced. The canines being so excessively developed and the cutting function being usurped by the long bladed sectorials, the incisors are much diminished. They serve only, apparently, for scraping bones.

In the elephant and mastodon the central incisors are developed into long tusks, which project outward many feet, and are employed as effective digging implements and piercing weapons.

Digitized by Google

With all these, however, man has little relationship, but these examples illustrate the various forms of the development of the central incisor in lower animals. With those that remain to be noticed we find the path of the evolution of man and note the stages through which his teeth have passed to reach their present forms.

Beginning with the *insectivora*, the living representatives of an order which was the apparent predecessor of the *quadrumana* through the *lemuridæ*, we observe first that this order presents many remarkable forms of the central incisor. In some of the moles the incisors are small, and in others, as the water-mole, the central is large and tri-hedral, like a cuspid with deep grooves. Owen says: "In the shrews the central is very large, with a large talon on the basal ridge, making a deep notch into which the procumbent lower central closes with a hook-like point." This talon with the deep groove or sulcus, is sometimes reproduced in man, with the characteristic backward curve of the body of the tooth. This notched incisor is characteristic of the shrews. "The shrew moles of America have large scalpriform incisors. The common mole has small incisors. The typical shrew usually manifests rodent analogy by the superior size of the anterior pair of incisors in both upper and lower jaws." But this resemblance is not structural and is only in regard to general contour. "In *sorex* the large upper incisors appear to bifurcate from the great development of the posterior talon." This talon is often repeated in man, probably more frequently on the lateral incisor where a lingual cingulum is not uncommon. "The hedge-hog has large centrals, sometimes with a large interspace." This is, perhaps, the precursor of the large interspace which is often present in man and is so frequently a matter of heredity.

In the *cheiroptera*, which are closely related to the *insectivora*, "the incisors are most variable and may be entirely absent. In the common simple-nosed bat the first superior incisor has a slightly expanded, tri-dentate crown, with a basal ridge of enamel. . . . In the blood-sucking vampire the centrals are large, compressed and sharp pointed. . . .

Digitized by Google

In the frugivorous bats the upper incisors are small with sub-incisive crowns." Some of the curious forms exhibited in the insectivorous series are passed on and reappear in the quadrumana and occasionally in man in whom the teeth are so erratic.

In approaching the quadrumana, the highest branch of animal life related to man by collateral descent from a common ancestor, we find that the lowest family of the order is that of the lemurs. Some of these are closely related to the insectivora as regards form, habits and dentition.

The lemurs present considerable variation in the form of the central incisor which advertise relationships with many groups below them, and present forms which are very aberrant. As Tomes says: "Most of the lemurs have upper incisors, which are small and widely separated from each other." One of the lowest as well as the most remarkable form, and one which is so closely related to the insectivora by its habits, is the little flying galeopithecus. Owen says: "In the colugo the two anterior incisors of the upper jaw are separated by a wide interspace," thus passing on the interspace noted in the moles. "In the Phillipine colugo these teeth are small with a simple bi-lobed crown; but in the galeopithecus the crown is expanded into a plate with three or four tubercles. . . . The lower centrals present the form of a comb, which singularity is produced by the deeper extension of the marginal notches into the crown, to form comb-like divisions. These are analogous to those on the edges of the human incisors, but the notches are more numerous and deeper." This tendency to division is recalled by the tubercles which are so apparent upon the edges of the incisors of man when first erupted, but are soon worn away. The longitudinal ridges which lead away from the tubercles are also suggestions of this primitive division of the crown, as an embryonic record of the history of its evolution.

Indeed Owen says, in speaking of incisors of the insectivora, that "In the progress of the formation of the large notched incisors, the summits of the tubercles are first formed as detached points, supported upon the common

Digitized by Google

pulp. In the human incisor teeth the dentated margin of which are likewise originally these four separate tubercles." This was apparent to the great anatomist before the days of philosophic evolution, and in our day the lesson is beautiful and striking.

In other forms of the lemurs the incisors are projecting, long and narrow and interdigitate with the procumbent lower incisors which pass between them for cutting vegetable fibre, as the green stalks of bamboo and other young, succulent twigs or trees. *Cheiromys*, the "aye-aye," has rodent incisors, which are not so vertical as the true rodent type but are more projecting. The common *indri* has large centrals, but in the woolly indri they are small. In the spectre lemur the centrals are larger than the cuspids, as also in the galegos. In the former they are long and pointed and have a basal ridge which is well defined, even on the anterior face, and is exaggerated into a prominent cingulum, on the lingual face. This cingulum is often repeated in man, but there is rarely, if ever, the suggestion of the basal ridge on the anterior face of the incisors in the human species.

The lowest monkeys, the platyrrhines (or wide nosed), the American species, are closely related to the lemurs in many respects, notably in having the third pre-molar. The central incisor begins to approach the final form in the higher groups of the platyrrhines, but is still somewhat aberrant. Like the lemurs, the incisors of both jaws are directed more obliquely forward and so are less vertical than in the higher apes and in man. As these are approached the incisors become more erect and the form of the crown is, in consequence, less curved, for in the higher primates it is straighter and more in a line with the long axis of the root. In the platyrrhines, however, it is still more or less of a scoop shape, resembling the lemurs. In the marmoset the centrals are large and trenchant, with a prominent ridge at the base. In the howlers it is wide and curved and a similar form prevails in the *ateles* and others of the American monkeys, with some variations toward the form of this tooth in the higher apes and man. The scoop shape is often recalled in man, with the characteristic curve and thin edge.

Digitized by Google

In the catyrrhines (narrow-nosed), the Old World monkeys, the centrals are much wider and larger than the laterals, but nearer the shape found in man, even in the lower forms. As Owen says, the incisors are always strong and thick, the centrals being greatly in excess of the laterals, the proportionate difference being much greater than in man. In the macaiques the centrals are more or less of the human form, except that they exceed the laterals in size so very much. In some of the baboons there is more or less of a basal ridge which is often greatly developed on the lingual face. This lingual ridge is often recalled in man, but not on the labial face.

In all the *anthropomorpha* the centrals are much larger than the laterals, are more vertical than in the lower forms, and assume the final shape presented in man. There is little real difference in the form of the central incisors between the higher apes and man, except in size and quality of structure and in the comparative size of the centrals and laterals. In man the extreme disproportion manifested in the apes is much reduced, *i. e.*, the centrals are smaller and the laterals are larger.

The gibbons are the lowest of the tailless apes. Their centrals are large and strong, nearing the final human form, except that they project and are somewhat of a curved form. In the orangs the centrals are of great size—are twice the size of the laterals, and have the basal ridge. This extreme size is recalled in man by those examples which we see of excessively large centrals. Owen says: "In the real orang-outang the median incisors of the upper jaw are of unusual size and strength. They are equal in both diameters at the base." Tomes says these teeth are similar to those of man, but larger. In the chimpanzee the centrals are very much reduced from the size in the orang, and approach the proportions of the same teeth in man, but with a prominent basal ridge as in the orang. Owen says: "In the chimpanzee the centrals are smaller than in the orang, and the laterals larger, but there is still a greater difference between these teeth than in man."

Digitized by Google

In the gorilla the centrals are still nearer the final shape as in man. They are of the same form and proportions, but are larger and of coarser structure than in man, as are all of the teeth of the greatest ape. There is little real difference between the central of the higher apes and man, for it assumes the final shape long before man is reached, and must have taken on this form before the differentiation which separated the human branch from the quadrumanous. As Prof. A. S. Packard says: "If, as is probable, man was evolved from some primitive lemurine form, and pursued a line of development parallel to, but immensely surpassing that followed by the lines culminating in the monkeys and apes, it is a matter of great interest," etc., and as showing the persistence of type and the singularity of the survival of this tooth in such perfection, for we find that the central incisor of man has lost nothing in the course of the evolution of the species; and yet it is little elevated above that of the apes. In fact, the general structure of the denture of man is degraded and primitive, for as Professor Cope says, "In his teeth man's character is thoroughly primitive, as witness the original quadri-tuberculate molar which has undergone but little modification," as well as other primitive features of the human teeth. The central has lost nothing in the process of the evolution of the species, for, while the other teeth have been degraded, it has maintained its own, and is really superior to the others in the retention of the perfection of its functional specialization.

DISCUSSION.

DR. EBEN M. FLAGG, of Asuncion, Paraguay. I would like to ask if the essayist thinks that the central incisor in man has reached its complete culmination, or whether, as Dr. Bonwill says, that it started and has since degenerated.

DR. A. H. THOMPSON, of Topeka, Kansas. We can hardly expect that the cutting function will be much increased. The chances are that with the rest of the denture the incisor will follow rather in the line of degradation than advancement. Many of the teeth of the human denture are

Digitized by Google

much degraded, and some are on the road to disappearance. The third molar is very erratic, and will probably be lost. The next is the lateral incisor, which also will probably disappear. The central incisor is really unique, because it does not indicate as much degradation as any of the other teeth.

DR. W. X. SUDDUTH, of Minneapolis, Minn. In what direction does Dr. Thompson think this retrogression will present itself, whether as to crown or root, or in what form will it occur?

DR. THOMPSON. There is only one way to answer that, and that is, that the lessening function will necessarily lessen the impulse of development in the whole organ. It is a question whether, in the higher development of the species, the teeth will be entirely reduced and destroyed. I believe they will be preserved for other functions through the law of collateral variation. I am not inclined to be as confident now of the entire loss of the teeth as I was at one time. The collateral variation will tend to the preservation of teeth for other functions than mastication.

DR. FRANK ABBOTT, of New York. Dr. Thompson's last remark surprised me, because there was a time when the essayist was very sure that it would only be a few years before we would be without any teeth at all; and I am glad he has arrived at the conclusion that we will have teeth, notwithstanding the fact that we grow older. I have never seen anything to convince me in the slightest degree that we are to become edentulous, or that we are to lose the use of a wisdom-tooth or the lateral incisor or any other. I believe to-day that we stand just as good a chance for a good set of teeth as we did thousands of years ago. In the skulls presented this morning in the general hall, there is a chance for study and observation. I have a theory in reference to the stunted condition of teeth, that it is due to a specific trouble or disease in the system. You know very well that the papillæ of teeth are affected very easily by disease, and that that disease may be so obscure that it may not be noticeable to the individual or any other person; and still you can find out that such and such a thing produces the disease, and if

Digitized by Google

we would turn our attention to that one direction, to the history of the individual from generation to generation, we would find that one of his ancestors would have presented sufficient cause in his condition for us to believe that the disease was transmitted to the individual. I have felt that there was an opportunity for a great deal of real study in that direction. That nature herself for want of use is to dispose of the teeth, in part or in whole, I cannot conceive; for I have never seen anything to make me think so.

DR. W. X. SUDDUTH, of Minneapolis, Minn. I have noticed in studying collections of teeth in relation to dental anatomy, that there seems to-day a larger proportion of short-rooted centrals than there used to be. It may be that I have within the last five years come across a larger proportion, accidentally, but it seems to me that in handling many thousand teeth each year, as I do now, that I have been struck with the point that very many central incisors had short, stunted roots. The query has come to my mind whether that is not a part of the necessary process of retrogression, which comes from the lack of the use of the teeth in this country, where we use so little hard food, and our food is prepared in a soft form. That is why I asked the question. This is also in keeping with my remarks last night, in regard to the effect on the roots of the teeth and not on the crowns.

DR. A. H. THOMPSON, of Topeka, Kansas. In regard to the shortness of central roots of which Dr. Sudduth spoke, I think that is a matter of temperament, or of ethnical peculiarities, because there is no doubt that there are distinct racial types of teeth, if we could diagnose them, just as there are of other parts of the body. That follows in the line of evolution and change. Of course the changes that are brought about in the evolution of the species are not to be noticed in the lifetime of any individual, nor, in fact, of a nation; but they may show the influences that affect the development of the teeth.

The subject was passed.

Digitized by Google

The following paper was then read:

THE HUMAN TEMPERAMENT IN ITS RELATION TO THE HUMAN TOOTH.

By Eben M. Flagg, D.D.S., Asuncion, Paraguay.

During the past ten years the value of dentistry to the world at large has been considerably enhanced. It has attained to a greater degree of scientific precision. Certain studies, whose paramount importance was not formerly recognized, have been added to our curriculum, and the result has been to subordinate that branch of our labor which is purely mechanical, and which for so many years preponderated to the detriment of other studies equally important.

In saying this there is no intention to undervalue the remarkable triumphs that have been achieved through dentistry in mechanical science during the past ten years. They are, indeed, such as any profession may well be proud of; yet one cannot help thinking that we have cause for congratulation in the fact that skill, which is purely mechanical, is no longer looked upon as the all-in-all of dental practice. For this advance in our science we are, nevertheless, very much indebted to mechanical inventions. They have relieved our drudgery, liberated our thought, and in many ways have multiplied our power of benefiting humanity, so that energies have been set free through the instrumentality of mechanical science that they might be directed to other lines of research with hopes of greater success than mechanical science has yet conferred upon us.

After manipulative skill had reached a point such as no other department of the healing art outside of dentistry ever attained to, we still found that manipulative skill alone was utterly inadequate to cope with the difficulties presented us through dental and oral disease. We saw brilliant operations, whose mechanical excellence admitted of no question, failing through causes that no amount of mechanical skill could ever reach; and we now find ourselves compelled to seek in other directions outside of mechanical science for the

Digitized by Google

solution of many problems that are demanding attention, and which must be answered if the claims of our profession to scientific precision are to receive acknowledgment.

One cannot fail to review with satisfaction the results that have already been accomplished in many directions, as, for example: The discoveries which have been made by Dr. Miller, of Berlin, concerning micro-organisms of the mouth and their effect on the teeth; the precision with which Dr. Davenport, of Paris, has demonstrated the importance of a physiological articulation of the teeth and its influence on the nourishment of the body; the value of the study of dentistry to assist in determining man's place in nature by Dr. Balkwill, of Plymouth, England, besides the work of many other earnest men who, starting from different standpoints, are, nevertheless, tending toward a concentration of their efforts that must add power and lustre to the cause which they serve so unselfishly, and, we may justly add, with no mean literary ability. So, having given all credit to every department of mental labor that tends to enlarge the sphere of our usefulness, I have now the honor to invite your attention to a consideration of the Human Temperament in its Relation to the Human Teeth.

There is no person possessing the faculty of observation but must have noticed the remarkable differences that characterize individual members of the human family; and, if we have any philosophical inclinations, they would naturally invite him to separate, group and classify those differences to the end that he might recognize the phenomena presented to him and the law by which they are governed. Such has been the case since the time of Aristotle ("who built his moral and political philosophy on the peculiarities of human organization"), even up to the present day.

The term that has been used to express these differences in the physical and mental constitution of individuals is that of *temperament*. This term has been so used from remote antiquity; and, although it has been urged recently by some that it is a term which does not adequately express the phenomena under consideration, no better word has yet

Digitized by Google

been proposed by those who disapprove of it; and, until some one can propose a superior successor, we must continue so to use the word. The fact that it has stood the test through all the varying developments of this study, from its simplest beginnings to its latest elaborations, should do much toward inclining us to the retention of the word, for, no matter how much temperamentalists may have differed as to the way this study should be pursued, all have tacitly agreed that the word was appropriate to express the ideas sought to be conveyed.

Hippocrates taught (B. C. 460 to 351) that there were four humors in the human body—namely, blood, phlegm, yellow bile and black bile—which gave rise to its various modifications, whilst Cullen (A. D. 1710 to 1790), who was the preceptor of Dr. William Hunter, would not admit of the existence of more than two temperaments—namely, the sanguine and the melancholic—which I here transcribe and tabulate. It shows how little had been accomplished up to his day concerning that study which plays so important a rôle in the diagnosis and prognosis of disease, as well as in determining the physical and mental qualities of individuals from a physiological standpoint.

Digitized by Google

THE HUMAN TEMPERAMENT, AS CLASSIFIED BY WILLIAM CULLEN ABOUT 1780.

INDICATIONS.	MELANCHOLIC.	SANGUINE.
1. Predominant characteristics.	Solids predominate.	Predominance of circulating system.
2. Figure.	Less plump and more firm.	Plump.
3. Hair.	Black.	Soft and light.
4. Eyes.	Black.	Light.
5. Skin.	Coarse and dark.	Smooth and fair.
6. Countenance.	Sallow and void.	Ruddy.
7. Disposition.	Gloomy.	Love for sensual pleasures.
8. Temper.	Suspicious.	Cheerful.
9. Manner.	Slow, grave, cautious and impassive.	
10. Pulse.		Strong and frequent.
11. Flesh.		Firm.
12. Susceptibility.		Great nervous susceptibility.
13. Memory.		Ready.
14. Unfavorable indications.		Inclined to diseases that are violent and inflammatory.

Digitized by Google

We see from the above that Cullen has given us merely what a casual observer might notice to-day, besides using words whose meaning is rather ambiguous, such as disposition, temper, etc.

Various theories have been advanced to account for those different mental and physical qualities under consideration which inhere in man and are not possessed by any other animal, and it has been sought to prove that they are but the results of his environment; that they are produced by the action of his surroundings, such as climate, soil, locality, habits of life, etc., upon his physical and mental frame; but no special temperament is the sole property of any special locality.

Wherever the Caucasian race is to be found, there we find manifestations of all the temperaments; and though there are localities where a certain combination of temperament is in the majority, so to speak, there is no place occupied by civilized man that is not represented by all of them, or where the soil, climate or environment has had the power of eradicating even one of them. So, concerning the cause of the temperaments, I feel impelled to take an agnostic position. To say candidly, I don't know, but have all hope that future investigations will bring us nearer to the cause sought to be ascertained. Probably there are those here present who can offer some ideas concerning the cause of temperament that may serve as a starting point in discussing the subject. If I may be permitted to hazard an opinion, I would suggest that temperament seems to be due rather to mental than to physical causes. Darwin has abundantly demonstrated that the force of the function helps to determine the form of the organ, while in everyday life how often we notice that habits of mind can produce a change in the expression of the body more certainly than mere habits of the body can produce changes in the mental constitution. The mind of a Robert Burns can elevate the coarsest toil more certainly than the coarsest toil can degrade the mind of the man. Mind and body undoubtedly act and react upon one another; but, where both are given free play, it seems to be in accordance

Digitized by Google

with the law of nature that mind should predominate. In speaking of *mind* I mean the function of the brain. Adhering to a belief in four elementary temperaments, the following is the writer's classification as tabulated ten years ago. These tables have been extensively published during that time, and seem to have withstood the test of criticism as well as could be expected. They are presented now with a few modifications in wording rather than any change in the substance, though the writer would be happy to make a change when future discussions shall have revealed errors in their composition. Temperament, as indicated by the teeth, and *vice versa*, is so marked and manifest that I have deemed its consideration worthy of separate tabulation: but bear in mind that in these tables I am describing principles and not persons.

Digitized by Google

THE FOUR BASAL TEMPERAMENTS AND THEIR GENERAL INDICATIONS.

	INDICATIONS.	BILIOUS.	SANGUINEOUS.	NERVOUS.	LYMPHATIC.
1	General Form of Framework	Tall, angular; square-built.	Fully, firmly-rounded contour development; medium height; robust.	Delicate; slight, but erect and well-proportioned.	Bulky; heavy; clumsy.
2	General Movement	Steady and persistent.	Graceful and easy.	Quick, but fitful in movement.	Unsteady; uncertain; loose-jointed; sluggish; deliberate.
3	Muscular Development	Knotty; prominent; hard; tense.	Well-rounded and graceful.	Well-defined; light, but sinewy	Large, but flabby and ill-defined.
4	Chest or Thorax	Square and capacious; good expansive power.	Well-rounded and capacious; deep and full.	Not broad, but prominent; very expansive.	Large, but lacking in expansive power.
5	Voice, Quality of	Strong, but inclined to harshness.	Smooth; sonorous; full.	Not very strong, but clear, penetrating and ringing.	Poor in vibration, but often soothing and quieting in quality.
6	Complexion and Skin	Brownish-yellow; tense, and inclined to roughness; dry.	Florid; smooth; warm.	Abounding in grayish tints; fine in texture, and elastic.	Pallid; muddy; moist and cold.
7	Favorable Endowments or Advantageous Indications.	Strength; endurance; fortitude; decision; firmness.	Hopeful; enthusiastic; aspiring.	Remarkable recuperative power.	Calm; cool; quiet.
8	Unfavorable Endowments or Disadvantageous Indications	Inclined to melancholy.	Lack of self-control; impetuous.	Mental fitfulness, and inclined to rapid degeneration or retrogression.	Inertia; low recuperative power in pathological conditions.
9	Cranial Contour	Square forehead and cranium.	Rounding and full forehead and cranium.	Cranium inclined to preponderance over face.	Forehead low and not shapely; often receding and flat.
10	Facial Contour	Angular; high cheek-bones.	Round.	Delicately oval.	Flat-faced.
11	Hair	Black, and closely curling; inclined to coarse.	Golden to light chestnut; slightly wavy.	Brown; wavy; fine.	Coarse; straight; drab, and sparse.
12	Eyes	Average size; black and strong in expression.	Large; full; clear; round; blue.	Above average in size; dark-brown; perceptive in expression.	Small, expressionless, and grayish.
13	Eyebrows	Heavy; strong, and straightly marked.	Fairly arched; not well-marked.	Fairly well-marked and arched; finely penciled.	Sparse and indistinct.
14	Nose	Strong in outline; Roman.	Straight and shapely.	Finely cut and often delicately aquiline in form.	Flat; also heavy and broad.
15	Lips	Large, and brownish-purple.	Ruddy and full.	Fine and grayish-pink, often beautifully curved.	Large, but not shapely, and pale.

Digitized by Google

THE TEETH AS INDICATED BY TEMPERAMENT.

GENERAL DIVISIONS.	BILIOUS.	SANGUINEOUS.	NERVOUS.	LYMPHATIC.
General Color and Quality of Color	Bronze-yellow, with strength of coloring.	Cream-yellow, and inclined to translucency.	Pearl-blue or gray; inclined to transparency.	Pallid and opaque, or muddy in coloring.
General Form	Large and inclined to angular; rather long in proportion to breadth.	Well-proportioned; abounding in curved or rounded outlines; cusps rounding.	Length predominating over breadth; fine, long cutting edges and cusps.	Large, but not shapely; breadth decidedly predominating over length; cusps poorly defined.
Surfaces of the Teeth....	Inclined to transverse ridges, and abounding in strong lines; neither brilliancy nor transparency of surface, but slight translucency.	Smooth or nearly so; elevations and depressions rounded; cutting edges and cusps translucent. Fair degree of brilliancy.	Brilliant and transparent depressions and elevations; abounding in long curves.	Surfaces of incisors devoid of depressions or elevations; opaque and dead in finish, even to cutting edge.
Articulation	Firm and close; well-locked.	Moderately firm; jaw inclined to rotate in mastication.	Very long and penetrating.	Loose and flat.
Gum Margin or Festoon	Heavy and firm, but inclined to angularity.	Round and full, as regards both breadth and depth.	Delicate, shapely, and fine; oval in curve.	Thick and undefined in shape; slightly curved.
Rugæ ...?...	Heavy and rugged in shape; squarely set.	Numerous and graceful in outline; not heavy but well rounded.	Close, not numerous; small and long.	Sparse and flat.

Pennsylvania College of Dental Surgery, December, 1883.

EBEN M. FLAGG, *Lecturer.*

Digitized by Google

In a former part of this paper the definition of "temperament" has been given as "the term used to express those differences in the physical and mental constitution of individuals," while in the tables of temperaments I have said little, or nothing, concerning the mental phase of the study. The reason for this is the difficulty presented by the study of mental characteristics in a society so intensely artificial as that produced by what we call the civilization of to-day.

There is such a constant pressure brought to bear against the development of individuality, and such a continuous effort to force a production of what shall be deemed fashionable, rather than what is natural, that it is often difficult to evoke from the individual any expression of thought or action that is not more or less under restraint. To get at the true inwardness of the mental constitution of the individual we must know how he or she would act in a sudden emergency, when there is no opportunity for previous mental preparation, when the mind is taken unawares, or when the tension of mental discipline is relaxed, and this, in the present state of society, is well-nigh impossible. This domination of fashion seems to come from a desire to reduce the manifold and complex manifestations of character to act only through one channel, and it makes us more prone to dogmatize than to analyze. I believe that a revival of the study of temperament would do much to correct this condition of error, for it has not only seized upon our minds, but has carried its devastating influence even to our bodies. Its results may be seen in our women of fashionable society, through their painted faces, dyed hair and distorted figures. Now, there is nothing more useful to demonstrate the folly of fashions than this same study of temperament, for fashion would make us monotonous by means of suppressive restriction, or a species of hot-house forcing of the mind, while the action of temperament, if it is given liberty, would tend to make us harmonious through natural combination. One proof of this is that we never see any temperament standing alone. In classifying the elementary temperaments we can only advance *principles*, valuable no doubt as formulæ for

Digitized by Google

study, but not met with in nature uncombined, whilst in the combined temperaments we can describe *persons* and produce portraits that imagination can recognize. If we would describe a person in whom the bilious temperament predominates, we could take that combination known as sanguo-bilious, the substantive "bilious" indicating the basis of the temperament under description, while the adjective "sanguo" expresses what is the modifying temperament. Professor J. Foster Flagg has tabulated the binary temperaments, and with his permission I will present a few examples. The modification of the sanguine upon the bilious seems to bring out more of the striking characteristics of the bilious temperament, and here is Professor Flagg's description:

"More than average size. Tendency toward irregularity, rather than rotundity, in form, in male and female. Complexion and skin fairly smooth; but little color, dark and yellowish in its tinting. Cheeks broad; forehead square, good size. Jaws large, angular and strong. Chin square and large. Hair black, or nearly so, coarse and curly, but usually not luxuriant in quantity. Beard is universal, rather than handsomely set. Eyebrows decided, but usually more straight than arched. Eyes very dark, or black, and strong rather than lustrous in expression. Lips average in size, inclined to large, and of a brownish red. Nose large and decided in contour." This is the sanguo-bilious combination, and typical of the bilious temperament. To this classification belong such characters as Abraham Lincoln; and is not the description nearly sufficient to enable an artist to paint his portrait?

The indications of the sanguineous temperament are well brought out by the combination known as nervo-sanguine, to which Professor Flagg gives:

"More than average size, well-built, marked depth of chest and breadth of shoulders; complexion and skin, fair and finely florid; cheeks, full; forehead, good; jaws, average, full and round; chin, average and round; hair, sandy to red, full in quantity and fair in quality; beard, sandy to red and wavy; eyebrows, light and arched; eyes, light hazel

Digitized by Google

to clear blue, usually larger than average; mouth, average size, but with a fullness of lip which gives it an appearance of more than average; lips, full and red; nose, usually shapely and inclined to large."

The only popular character that I call to mind at present who answers to this description is the political economist, Mr. Henry George, and I think his friends would have no difficulty in recognizing the likeness. A temperament in which the nervous basis is indicated may be seen in the sanguo-nervous, of which Napoleon Bonaparte is a good type, while the characteristics of the lymphatic temperament are brought out by the combination known as bilio-lymphatic, referring you to Professor Flagg's tables for a description of the same.

Thus we see how every phase of character, every form of feature, every mental endowment, may be more or less identified through a discriminating study of temperament. It would lead us to study our patients generally before examining their mouths, and indicate beforehand with more or less certainty the character of the trouble that the patient would be most likely to suffer from. It would do much to settle those disputes which men equally conscientious in their research are prone to engage in through the mistaken idea that humanity can be reduced to a kind of level, and every aspiration of man be forced to act through one channel. And it would also help dentists to solve many problems that are now the subject of dispute or involved in obscurity. But let me illustrate. I will read from the nervo-bilious temperament, as described by Professor Flagg:

"Whether tall or short, of average size; average osseous, muscular and contour development; complexion and skin inclined to dark; high cheek-bones; forehead, large; jaws, small; chin, small; hair, dark, usually decidedly curly, of average quantity and quality; . . . eyebrows, decidedly marked, but not decidedly arched; eyes very dark brown, average size, but with much perceptive expression; mouth, average size; lips, thin and shapely; nose, usually very shapely, with slight or decided tendency toward aquiline;

Digitized by Google

teeth, a combination of yellowish and bluish colors, enamel good, dentine soft; size and form of teeth, long and narrow, with long cusps."

Here we have a union of two temperaments that would seem more or less incompatible. The tall, massive, angular, square-built frame of the bilious joined to the delicate, slight, but erect and well-proportioned frame of the nervous. Professor Flagg, with his usual power of penetration, has presented us with a description that can be clearly distinguished by the mind's eye; and I would ask any dentist of average practice if he has not observed how many patients answering to this description are strongly inclined to dental irregularity, and how this must be the case where the small jaw of the patient, partaking of the nervous temperament, may be provided with the large tooth belonging to the bilious; and so illustrations could be multiplied indefinitely; but rather than further extend this paper, which touches on a branch of study that seems well-nigh inexhaustible, and believing that enough has been said to illustrate the importance of the study to the scientific dentist, and prove that we cannot afford to ignore it, I prefer to close the essay at this point, and request further light upon the subject which will, no doubt, be shed through the medium of a general discussion.

DISCUSSION.

DR. A. H. THOMPSON, of Topeka, Kan. The paper struck me as being something which needed expression in our college work. I have had occasion to regret that there was nothing explicit in our literature which we could use in our instruction to the student in regard to this particular thing. It is necessary that the practitioner should be able to diagnose the different temperaments, particularly in regard to the making of artificial teeth for edentulous patients. It is important for the young practitioner to distinguish at least the one temperament that predominates in the individual. The question is difficult and obscure, of course. It may have an ethnical basis; but we know that

Digitized by Google

in all nations and races there are differences in the individuals which are temperamental, and which may almost be called racial differences. It is possible that temperaments may have originated in the early development of the races—their evolution from the earliest form—but of that we know nothing. We cannot say to-day that any races with which we are acquainted have any predominant temperament.

The temperaments are more manifest to us in Europeans than any other races on account of our greater familiarity with them. Temperament exists among other races, and influences the individuals just as much as in the European races. It exists also in animals. Some horses are more nervous than others, and have a different organization. That brings us back to the idea of the man who first described temperament—that it may be organic and not ethnical, after all. The question is still very much confused and in want of light. Any contribution to it is valuable.

DR. W. X. SUDDUTH, of Minneapolis, Minn. The subject of temperament is one that has interested me very much, and, as Dr. Thompson says, it should be taught in our colleges. I have always had an interest in the study of physiognomy. In the face we have depicted the attributes of mind, and, to a certain extent, the innermost thoughts of the individual. In addition to that, dentally, the teeth are also types of temperament. There is a correlation between the physiognomy and the teeth; a marked analogy which can be borne out certainly exists. Given the teeth of an individual, one who is well up in those studies can tell you what the physiognomy is; or, given the physiognomy, can tell you what will be the teeth. There is a great correlation between these two features of the anatomy. I formerly laid more stress upon the study of temperament than I do at the present time. I was carried away with it to a certain extent, and started in to mould and modify my practice, based upon the temperamental attributes as depicted in the study of the teeth. I believe that there is a great deal in it. I cannot help but believe that a scientific study of the temperament—especially of the physiognomy—will give a person an insight

Digitized by Google

into human nature to such a degree as to make him more successful in life than persons who do not understand those things. A successful business man can, at a glance, take in the temperament, and the mental and physical characteristics of the individual with whom he deals, although he may not be able to put it in a tabulated form as Dr. Flagg has done. If dentists would make more of a study of this I think they would be more successful. Many of us study and practice dentistry from the standpoint of the forceps and plugger, and let the business part take care of itself.

There are two sides to dentistry, however, and a man ought to study them both. There is no doubt but that temperament has very much to do as Dr. Flagg has indicated with the intensity of inflammation. That is a point that has been described and is well known. For instance, a sanguine temperament is one in which we have all inflammatory processes taking on a very acute form. Not only does the sanguine temperament tend towards acute inflammation; but, if the remedy is applied in the right way, the inflammations respond readily. The lymphatic temperament is to a more or less extent a negative temperament. It does nothing in a very vigorous way either as to getting sick or getting well. It is a slow, sluggish and undesirable temperament to possess or to treat. Every one should have some special line of research that will take him out of the humdrum of everyday practice. I take it from what Dr. Flagg has said that he takes pleasure in this particular kind of work. We have had an able paper from him, and one that I am glad to have presented before this section.

DR. THOMPSON. One thing which has retarded the development of this question has been its association with the science of physiognomy and phrenology. Every man who looks at these things is generally struck with their absurdity. The study of temperament has been associated with them, and has been dropped without leading a man to any definite conclusion in regard to it.

DR. FLAGG. Dr. Sudduth remarked that he paid more attention to this subject formerly than at present; that he

Digitized by Google

had been somewhat disappointed as to the value of temperament as a study. There are to-day, as there were in the time of Shakespeare, "men whom nature makes by scores and hundreds, and puts no mark upon them," and of course there are many in whom the temperament is so obscure that one in trying to reason out what that temperament is would almost be inclined to say that temperament is a "fraud." I account for this in the tendency that has arisen for certain fashions to predominate to the detriment of individuality; and, either through the influence of dress or some other monotonous pressure, like artificial behavior, has brought us nearer to a dead level, so to speak; and thus temperament has not had what we would call a fair showing. In regard to its being allied to the pseudo sciences, it is true that we have, in considering temperament, unthinkingly been brought to consider such studies as phrenology; but I think, as to palmistry and phrenology, that their truth on scientific bases may possibly be found in temperament. Chemistry and astronomy are now both considered as exact sciences, yet much of chemistry was developed through the wildest kind of doctrines about the "philosopher's stone," and for generations its truths were concealed among the vagaries of alchemy; while, as to astronomy, its truths were concealed in astrology; and it was for centuries considered as a sort of divining art, thoroughly hateful to the Church, which relentlessly persecuted astronomers for declaring that they could explain the true system of the universe; but astronomy now stands as a real science, and upon as high a plane as any of our sciences. Although I have not been able to make so full a presentation of the study of temperament as I would like, still I think, if the paper will serve as a beginning to interest scientific dentists in the subject, that I shall feel fully compensated for any study I have made in this direction.

Adjourned.

Digitized by Google

FOURTH SESSION.

The Section met on Friday, August 18, at 2:30 P. M.

Dr. C. P. Robinson, of Mobile, Alabama, was appointed temporary chairman.

A paper entitled "Hypnotic Suggestion as a Dental Obtundent and Sedative," read by Dr. Thomas Fillebrown at one of the general sessions, having been referred to this Section, was then discussed as follows:

DISCUSSION.

DR. C. B. ROHLAND, of Alton, Illinois. Are all temperments alike subject to the hypnotic treatment?

DR. THOS. FILLEBROWN, Boston, Mass. Yes, all are subject but to different degrees. I want to mention a little incident. A friend was with me at the Fair the other day, and there saw a picture which I think many of you may have seen. There were three views. The first represented a man with a very sober face; in the second, he had begun to read something, and his face had lightened up considerably; and in the third picture he had burst out laughing in a very hearty way. I thought this a good chance for a demonstration, and said to my friend: "Here is an interesting picture." I called his attention to the sober face first. I saw him look at the second view, and then I saw him look at the third. The expression of his face followed the illustration, and when he got to the third he burst out laughing. There was no magnetism from that picture to him. What was it? It was the suggestion that picture made to his mind. You attend a theatrical performance, and see a person come on the stage, and you remark, "What a funny-looking fellow." He may not be dressed out of the common course, but there is something about him that suggests the idea of mirthfulness. You see the next person come in with the appearance of sorrow, and you respond accordingly.

Who will make the best hypnotists? Those who can suggest best. A person who is timid, ignorant, and of a

Digitized by Google

different temperament, may not be able to suggest so well. If the patient be fine-bred, and the operator is coarse and dirty, of course there will be no sympathy; but if an operator is intelligent, cultured, and has accurate information as to what he wants to do, is consequently self-possessed, and has all the elements that a skillful practitioner has, then he can suggest to the patient. If a patient came to you with the expectation and the wish to be hypnotized, don't you see that as soon as he enters your door he is half-hypnotized, because the suggestion rests with him, and he knows that he is to be hypnotized, and that you are the one to do it. When you attempt to complete the hypnosis, it is very easy indeed.

DR. J. D. HODGEN, of San Francisco. I have a case that I would like to place before Dr. Fillebrown for his opinion. In administering nitrous oxide, at one time, I had an assistant, a college student, and I taught him to operate the cylinder which led to the reservoir used for such purpose. Having filled that, I was not aware that there was some obstruction between the reservoir and the mouth-piece. I administered it to the patient, and instructed her how to inhale it, as she had not taken gas before. She passed through the regular, ordinary phenomena which are reached by the administration of nitrous oxide, and I extracted three teeth. She was awakened from the anæsthesia, and was perfectly normal, just as she would have been after the administration of gas. To my utter astonishment, upon examining the reservoir, I found she had not taken a cubic inch of gas, yet she went through all the symptoms. I would like to ask if there is any connection between this and hypnotism.

DR. FILLEBROWN. I cannot see the connection, because the condition is hypnosis. That patient was thoroughly and completely hypnotized, under the suggestion that she was to be anæsthetized, and that it was to take this form, and the suggestion in the patient's mind carried it out. I feel indebted to the gentleman for speaking of this case. When you come to look back over your experience, the most of you will see that you have practically been hypnotizers

Digitized by Google

through a long series of years. You will find that you are in just the condition that a gentleman was who remarked to me a little while ago, "Well, I have been doing just that thing right along, and did not know it." You have ignorantly practiced it, and I come here and declare to you a way by which you can use the method scientifically and methodically.

DR. R. J. PORRE, Cincinnati, Ohio. I have had some experience in this line. I have tried it successfully in extracting teeth. There is no question as to its usefulness. Dr. Fillebrown has not said a single thing but what is applicable in practice.

DR. G. V. N. RELYEA, Oswego, N. Y. The essayist says he does not depend on it for extracting teeth, although I think he said he had hypnotized a person in one case and then administered ether. It impressed me forcibly, and I am delighted to hear what Dr. Fillebrown has to say. There is no one in the profession who has not found it difficult to get the patient to commence inhalation. Would not this be a good way to start them into taking the anæsthetic? Hereafter, if I have that kind of a patient, I shall certainly resort to the system of hypnotizing him. Don't you depend on it at all for extracting teeth?

DR. FILLEBROWN. I use it for preparing the patients for the anæsthesia. In individual cases it may answer for the extraction of teeth.

DR. RELYEA. In administrating ether, it is very important and essential to educate your patients; first get their confidence, and then say to them, "Inhale this, and follow my instructions strictly. You may be partly conscious, but at the same time it will take away the keenness of the pain, and perhaps take the pain away altogether." Give them these instructions, and you will succeed beyond your expectations.

DR. J. O. BROWN, of Chicago. Does Dr. Fillebrown find that many of his patients object to being hypnotized?

DR. FILLEBROWN. A great many do object. If they do not want it, that ends it.

Digitized by Google

You can all do much of what I have described immediately when you get home. You can experiment on the first patient you have, whether he knows anything about hypnotism or not. Two friends of mine in Boston have had a great deal of success in this way. Say to your patient, "If you will do as I say, you will find the pain very much relieved. You feel like resting." While you are saying that, if you will watch carefully the muscular tension, you will notice how it relaxes in less time than I have been rehearsing it to you. Then go on and do just as I have described. Do it quietly, and you may be sure that it will help wonderfully.

DR. H. J. MCKELLOPS, of St. Louis, Mo. How many men have that power? I have paid a great deal of attention to this. It was illustrated at the Mississippi Valley Dental Association ten years ago. It is all very well for certain people to do that, but I can take any patient, and by kindness and gentleness in my operation, do anything that he does, without any hypnotism.

If you treat your patients kindly, and operate gently, you will get the same results as my friend gets from hypnotism.

Many men in the profession lack that kindness and gentleness in operations that would make them successful. I formerly used ether and chloroform to a great extent. I gave it to man, woman and child, and I am surprised that I did not kill some of them. I gave it promiscuously, but I have quit doing so. I have done away with those things. I can, by careful operation and handling my patients with care, accomplish anything that can be done with anæsthetics. I want my patient to know what I am doing. I have tried it until I have worn myself out, and I have seen all there is to be seen of this thing in this country. When the profession looks into these things, it will see that kindness will accomplish just as much.

DR. FILLEBROWN. Everybody in this world will find some other body that will be influenced hypnotically by him. I know that Dr. McKellops can do anything that I

Digitized by Google

do. If there is any man on earth who hypnotizes his patients, it is Dr. McKellops. His is one of the surest ways of hypnotizing, Dr. Liébeault was asked once how he cured his little children. He said, "All I do is take them in my arms, lay my hands on them, and they are cured."

Another excellent point Dr. McKellops has made is, that practicing the art of hypnotism helps the operator. It forces to kindness. No man can practice hypnotic influence or suggestion, unless he is kind and moderate, and careful with his patients, and that is one of the greatest lessons we learn. Dr. McKellops evidently did not take in the point of my paper. Hypnotism and McKellopsism are synonymous.

DR. GEO. W. WHITEFIELD, Evanston, Illinois, said that forty or fifty years ago this subject was prominently before the public, but it fell into incompetent hands, so that of late years it has been all that a man's reputation was worth to take it up. The speaker felt sure that Dr. McKellops had practiced it for years, but he called it kindness. If it is tried and failure results, it is because the operator has not confidence in himself. He suggested that it be used a little more carefully and intelligently.

DR. N. J. ROBERTS, of Waukegan, Illinois, corroborated Dr. Fillebrown's statement. He used it now, but had to do so secretly, as parents objected to their children being so treated. He mentioned cases where he had used it in cases where the patient had been unable to tolerate any treatment before.

DR. JOHN S. BURNETT, of Salto, Uruguay, expressed himself as convinced by practice that the treatment was attended with success.

DR. E. S. CHISHOLM, of Tuscaloosa, Ala., said he was surprised that the subject should be so seriously discussed by intelligent men. He mentioned the case of an old negro woman who desired to have a tooth extracted. She had heard of extracting teeth by electricity, or galvanism, and said she wanted it extracted with galvanism. They gave her in one hand an old lamp and in the other something else

Digitized by Google

and told her to hold on tightly, that the galvanism might pull the tooth. Upon applying the forceps and extracting it, she expressed herself as having experienced no pain. He also mentioned the fakirs who go about the country professing to pull teeth without pain; they use a little cocaine or some such material, and if it does hurt the patient is ashamed to cry out; that is the way they do "painless extracting." He had not heard a single argument to demonstrate any science in it.

DR. JOHN RABE, of San Francisco. I just would say a few words of my experience referring to the usefulness of hypnotism. I consider Dr. Fillebrown's paper on the subject the most able I have read or heard, and heartily congratulate him for it. I have had to make use of it myself, but have had a Dr. Jurcowsky often come to my office and hypnotize our patients for dental operations. I call to mind one case, a lady 45 years of age, who would never go to a dentist's from fear. She required a bridge from second bicuspid to second molar, and the doctor hypnotized her and suggested while asleep that she should feel no pain on the right side of her body. I extracted the pulp of the bicuspid and prepared and made both crowns, and on another day forced the bridge up to place in the good old style, and she declared that she felt no pain. As she was suggested to feel no pain on half of her body, I tried at various times during the operation pinching her on different parts, and the slightest touch on the left side would set her screaming. I even stuck an instrument into her right arm and she was not conscious of it, although she was not asleep after the doctor left. The doctor would generally hypnotize the patient and while asleep suggest or indicate to her what she should *not* feel, and then she would wake and be sensible to all other natural influences but the one indicated. I have also filled large labial cavities in the upper central teeth that I had not been able to do after many trials.

Another peculiar case which I can't refrain from mentioning: A lady 35 years of age, who required a bridge from first bicuspid back. She was a patient of the doctor's,

Digitized by Google

and as she was highly nervous and sensitive, I asked the doctor to come with her. I finished the work as usual, but when she looked in the glass and saw an *old-fashioned gold crown*, she was dismayed. "O! I will not have that gold, you must take it out again." I said, "There is no gold visible." She said, "There is, and please take it out. This is simply horrible." I repeated my remark that there was no gold visible, and asked the doctor to convince her. Well, he hypnotized her and while asleep told her that it was porcelain, and to say no more about it. She came to herself, looked in the glass, and said: "How beautiful, they are so much alike that nobody would think they were false." That was repeated two or three days, and now nobody could persuade that lady that that tooth was of gold and not of porcelain. I have many other experiences, but have not had time to call them to mind that I may describe them to you in plain language.

I am sorry to say I have kept no written statistics.

DR. J. Y. CRAWFORD, of Nashville, Tenn., thought he must be hypnotized, as he had fully made up his mind not to speak on the subject, but now he was speaking. If he could be made to believe that he could only exercise one faculty at one time, he would believe in hypnotism; but he did not believe, as one of the speakers had said, that such was the case.

He mentioned the case where a friend of his and a believer in the subject asked him to witness a demonstration. This he did, and he noticed that the person who was alleged to be under the influence put out his hand to prevent a screen on the stage from falling. Upon questioning the subject, he admitted that he was playing a part.

DR. GEO. W. WHITEFIELD, of Evanston, Illinois. It is plain to see that there are doubting Thomases here. As well deny the possibilities of mathematics as to deny the manifestations of suggestion, popularly called mesmerism and animal magnetism, hypnotism, etc., still Mr. President, I find it in my heart to forgive these out-of-date people for the reasons that all the popular books on the subject ascribed

Digitized by Google

ridiculously absurd power to the operator, assume that he controls some settled electrical fluid and by his passes he is enabled to compel his subjects to perform acts contrary to their wish; suggestion means putting to sleep one's individuality and acting on suggestions received or on those that the subject imagines he has received; to be a successful hypnotizer one must belong to one of two classes—he must be an extremely conceited, ignorant, man who believes he possesses a supernatural power and by his sincerity impresses the subject with his suggestions, or he must knowing that he possesses no power more than others possess who have self-control; he must assume that he has this power in such positive manner that his subject will believe him, and do what he is told to do; the subject must surrender to his suggestion.

If any of you after eating a hearty meal were told that what you had partaken of contained something disgusting and you believed the suggestion, the effect would nauseate, a physiological change due to suggestion.

The Christian Scientist's statement that there is no disease and the subjects believing the suggestion produces physiological change in some, and the patient gets well. Many of you as school boys remember headaches that would prevent you from attending school, but you could play ball or go fishing and be well. More than one-third of the incurable invalids would get well if they had to work, as their invalidism is due to the same causes that produced the inability to walk in the wood-chopper, whose axe glanced and cutting a great dash in his boot, and as he thought that his foot was nearly severed he could not stand on it, the pain was so great, still when the boot was removed not a scratch appeared on the flesh; a suggestion had taken possession of him. I do not doubt that he suffered as much at the time, and perhaps more than he would had he been cut; suggestion to him meant pain; suggestion from the skillful dentist may mean no pain; a suggestion of something foreign to the work in hand may arrest the attention while the painful part of the work is being attended to, for we are incapable of

Digitized by Google

receiving more than one sensation at the same instant of time, and the sensation we become conscious of is the sensation our attention is directed to. Time will not allow me to follow out this thought, but I refer our southern friend, Dr. Crawford, to an article in the *International Dental Journal* of December, 1889, page 731, and January, 1890, page 16.

DR. C. R. TAYLOR, of Streator, Illinois, indorsed Dr. Fillebrown's position, and gave instances in his own practice.

DR. J. D. PATTERSON, of Kansas City, Missouri, thought there was such a thing, and that he had exercised such influence over his patients; but he thought it should not be generally done, but should only be practiced by specialists.

DR. FILLEBROWN then took one of the members and showed how he proceeded to practice hypnotism, merely using him as a dummy, and not giving a practical demonstration of putting a person under hypnotic influence. His plan of work was as he had described in the paper, putting his hands on the patient's head and body and talking to him, assuring him that he was asleep and would suffer no pain during the operation.

The Section then adjourned *sine die*.

Digitized by Google

SCIENCE—DEPARTMENT A.

SECTION II.

ETIOLOGY, PATHOLOGY AND BACTERIOLOGY.

Chairman, G. V. BLACK, M.D., D.D.S., Jacksonville, Ill.
Vice-Chairman, GEO. S. ALLAN, A.M., D.D.S., New York, N. Y.
Secretary, E. S. CHISHOLM, D.D.S., Tuscaloosa, Ala.

OPENING SESSION.

The Section was called to order by Dr. G. V. Black, Chairman, at 2:30 P. M., who then delivered the following

ADDRESS.

Gentlemen: To-day we open the second Section of the World's Columbian Dental Congress. As chairman of this Section it becomes my pleasant duty to welcome you. We are gathered here in this young, prosperous and beautiful city of Chicago, on the bank of this great fresh-water lake—Michigan—surrounded by a rich and beautiful country. We are also surrounded by the exciting scenes of a great International Fair and by the multitudes of people gathered here from all parts of the world. Here, in the midst of the hurry and bustle of sight-seers, we propose to stop for a time for the consideration of grave questions pertaining to the health and comfort of our fellow-men. For although the matters to come before this section are regarded as pure

Digitized by Google

science they pertain directly to the healing art, and it is upon this pure science that the art and the practice of our profession is founded, and to which it looks back for the basis of its support and for correct principles of practice.

In this section of the Congress we will devote our energies to the subject of Etiology, Pathology and Bacteriology. Of these the two first have attracted the attention of physicians from the dawn of the science of medicine; and now in the last half of the nineteenth century, the third—Bacteriology—has awakened to unlock and explain a large part of that which before was mystery unexplainable in the other two; or in the causes and nature of disease. It is therefore well that these subjects should be grouped together in our consideration of them. They are subjects which should cause us to pause, to listen, to think, and to do our utmost to understand. Their hidden secrets are being brought to light by those devotees to science who are performing the peculiar and intricate labor necessary to discover them. These are fields of labor in which, from their nature and the intricate character of the studies required, but few of us can enter in the capacity of original workers. We should encourage these workers by our thoughtful sympathy and counsel. We should engage with them in the discussion of the results of their work. They have prepared their papers that we may learn of the discoveries made, and of their significance and practical bearing in the fields of applied science. It is not all to discover isolated truth—to wrest a fact from nature's secret storehouse. The application of that fact in art or the use we may make of it in its co-relation with other facts is quite another matter; and this second stage of discovery, if such it may be called, is often as important and as difficult as the original find. We are here to learn of the first and to assist in the second by our sympathy and counsel. We would prove the good things brought to us by grinding them between mind and mind in friendly discussion to disclose their useful qualities, as the grinding between stone and stone brings out the better qualities of the grain and fits it for the loaf.

Digitized by Google

To the reading of these papers I welcome you; to the discussions which shall follow I welcome you; to the substantial mental gains that shall accrue from this meeting I welcome you; to the friendly intercourse of our scientific counsels I welcome you. And in the interims of our meetings I welcome you to the lighter intercourse with our brethren who will be glad to greet you, one and all, whether you come from a sister city with Chicago, a sister state with Illinois, or from a sister country with the United States.

And then there is the Fair down on the lake shore which you may be interested to stop and see. I hardly know whether to say it is the whole world in miniature, or to say it is the whole world *in extenso*. But it will speak for itself. Go and see it. Study, if you will, its architecture; its arts and its manufactures; its products of husbandry and its live stock; its implements of peaceful industry and its implements of war; its styles of civilization and its manners of social intercourse; its strong men and its weak men; its plain women and its beautiful women; yes, its all, if you will. To all this and the wonderful City of Chicago, a growth of but little more than a half century, I welcome you. And when you return to your homes may it be with a feeling that it was good to attend the Columbian Dental Congress; that it was good to attend the second Section of the Congress; that it was good to see the Fair; and that it was good to meet with the dental profession in Chicago.

Adjourned.

SECOND SESSION.

The Section was opened Tuesday, August 15, at 2:30 P. M., by the Chairman, Dr. G. V. Black.

A paper read by Dr. O. Zsigmondy on "Congenital Defects of the Enamel" before the general session, and referred to this Section for discussion, was passed.

A paper entitled "Adenoid Growths" was then read:

Digitized by Google

ADENOID GROWTHS AND OTHER DISEASES INCIDENT TO PRIMARY DENTITION.

By Annie Felton Reynolds, D.D.S., Boston, Mass.

Dentition is a purely physiological process and, like all such, is subject to irregularity and modification from local and constitutional disorders, both hereditary and acquired.

The deciduous teeth, twenty in number, are erupted usually between the sixth and thirty-sixth months of the child's life.

There are instances of full sets present at birth and those showing the incisiors are by no means rare.

As early as the forty-seventh day of intra-uterine life there are indications of the development of the deciduous teeth. Premature dentition has been said to be evidence of tubercular, scrofulous or syphilitic diathesis, although this does not, by any means, prove the rule.

Teeth that are cut late are frequently marked by imperfection of the enamel, are lacking in density, and decay early; this is probably due to imperfect nutrition caused by the same constitutional defects, which tends to imprison them longer than the normal period. Syphilis sometimes brings about a retardation, more or less marked, in dentition; under its influence the infant cuts its first teeth only in the tenth, twelfth or fifteenth month and sometimes even later. This retardation in dental evolution, when it occurs, is usually general, that is, it involves the whole dental system; it may, however, localize itself upon a single group of teeth, as, for instance, the incisors subject to early decay. Unfortunately, the changes in the deciduous teeth in congenital syphilis, unlike those of the permanent set, are not sufficiently marked to prove of diagnostic value. Sore throat is a congenital manifestation of the inherited disease, showing itself in mucous patches in the throat. The contagiousness of the lesions of a syphilitic infant is undoubted.

During the dentition epoch the whole organism is in a state of active development; the nervous system has not acquired stability and is exceedingly susceptible to external

Digitized by Google

impressions, evinced in the marked manifestations of disturbed functions that are produced by what in the more mature individual would be considered trifling affairs.

Children, strong and healthy up to this period, droop and die. The older practitioners and the laity are firm in the idea that dentition plays the most important part in the etiology of convulsions. If the child happens to be cutting teeth at that time, no further cause for trouble is looked for, and if there is no visible irritation of the gums, still the advancing tooth is thought to be the cause of the attack, the exciting cause being thus frequently overlooked. Of course, delayed dentition, by reflex action upon the nervous system, may cause convulsions, especially when there is a predisposition in that direction, but the delayed and irregular dentition is more often but another sign of the rachitical tendency to which eighty per cent of convulsions is due, and this, instead of dentition, is more likely to be the predisposing cause, although an inflamed and tender gum may precipitate a paroxysm.

The time of dentition is a period of great functional activity, for, beside the eruption of the teeth, the follicular apparatus of the intestines is undergoing active development in order to prepare the system for a radical change of diet. As a consequence gastro-intestinal disorders and nervous symptoms are frequent at this time. The presence of undigested and indigestible food in the stomach and intestines is a very fertile cause for convulsions. Overfeeding with proper food becomes an exciting cause, especially during hot weather. Cutaneous eruptions are very common at this period of the child's life and may appear cotemporaneously with the cutting of a tooth; the delicate, sensitive nature of the child's skin renders it susceptible to disorders from slight irritation. Salivation is of frequent occurrence with children, apart from the usual flow which accompanies dentition. It is a characteristic symptom of ulcerative stomatitis, which often finds expression in gingivitis. The saliva, when abnormally abundant, is diffluent with flakes containing epithelial cells and mucous corpuscles: it is apt to be mixed with mucus

Digitized by Google

when there is much stomatitis. It is alkaline, or neutral, rarely if ever acid unless from decomposition of sugar in the mouth, and the proportion of ptyalin is deficient; indeed, up to the sixth month the infant's saliva contains no ptyalin and, therefore, it should receive no starchy food.

The most important condition likely to appear at this period, and the one which to the dentist is of especial interest, is that of abnormal growths in the naso-pharyngeal cavity. That the influence of nasal obstruction is the causation not only of morbid conditions of the whole respiratory tract and middle ear, but also of pathological changes in other and remote organs of the body, is grounded on the firm foundation of every day clinical fact and experience.

The affection appears as the most formidable enemy of childhood and one very important to detect and eradicate. It is remarkable that a disease attended by such striking symptoms should have escaped recognition and treatment until the present generation, but such is the case, and although but twenty years have elapsed since William Meyer, of Copenhagen, fully described this affection, his observations were not utilized in the practical manner they deserved until many years subsequently.

Adenoid growths are comblike forms which attach to the posterior wall of the naso-pharynx; in appearance that of masses, which, while as a rule pediculate, and varying in size from that of an almond kernel to a grain of wheat, may be nearly sessile and be uniformly rounded; they are of a reddish color, of fleshy consistency and very vascular. After removal they lose their color and appear as hard, gray seedlike bodies. The mucous membrane seems to be free at the base of each mass, and from its pedicle. Pendant as a rule from the vault, on a line with the fossa of the eustachian tube, the growth may lie posterior to the fossa, or upon the parts which are parallel to the posterior walls of the pharynx. The growth seems to spring in the main from the mucous membrane covering the localities where connecting tissue fills in the inequalities at the base of the skull. The variety of the masses usually seen is pedicu-

Digitized by Google

lated, while in late childhood and early adult life the broad base growths alone are seen. These vegetations may, as remarked, persist until early adult life. The masses then seen are not large, but, while not creating obstruction in breathing, may excite and maintain a catarrhal state of the membrane, both of the nose and of the pharynx. The symptoms of adenoid growths may be placed under five heads, respiration, secretion, speech, hearing and general condition. The respiratory effects are direct and indirect; the direct effects are seen in the obstruction of nasal and the establishment of oral respiration. The general state of the patient is affected in many ways by the presence of the growths; the imperfect rest and unnatural breathing creates anæmia, which, occurring in the system at an age when the growth forces are actively engaged, may lead to lack of development of the bones of the face, deformities of the upper jaw, irregularities of the teeth, misshapen chest walls, deafness and defective speech.

When the mouth-breathing is of long standing, the superior dental arch ordinarily is contracted and the roof of the mouth is elevated. In a child of two years, which is the average age when the trouble begins, although the growth may be found in the infant of a few days, little else than difficulty of breathing, especially at night, is noticed. An ordinary cold may have been the initial cause; the child soon shows a tendency to repeated attacks of cold in the head, which increase in frequency and duration; these are accompanied by considerable nasal discharge, which, however, may be entirely absent when the child is free from acute attacks. Deafness, in the majority of cases, is soon added to the list of discomforts, and by the time the child has reached the age of six, eight or ten years, the characteristics of a typical example of adenoid vegetations is as follows: the child is a mouth-breather, its facial expression is dull and stupid, oftentimes idiotic. The open or half-closed mouth is one of the most constant symptoms. Nasal breathing is interfered with during the day, but it is at night that this symptom displays itself with greatest promi-

Digitized by Google

nence; the child never sleeps soundly; it assumes unnatural positions in bed; and the slightest noise will awaken it. During the day the child is languid and irritable. The majority of such children are deaf, and their voices are stuffy and thick.

Again, the nervous symptoms sometimes associated with this disease are abnormal sensations in the head and pressure in the upper and back part of the cranial cavity.

When once established some of these results remain through life, others may be removed or corrected by clearing the air passage; all of which could have been prevented by an early removal of the growths whereby natural and free breathing would be established through the nostrils.

For what does it mean for an infant or a child to have the nasal breathing impeded?

It means that it is being starved for want of air, and the younger the child the more difficult it is for it to get air into its lungs through the mouth.

There is a definite relation between these conditions and the V-shaped palatine arch, which has not been appreciated in considering the acquired causes of irregularities of the teeth in children and which should be emphasized. The high arched palate always presents in typical cases of this abnormity, moreover it is one of the earliest mechanical results of obstructed nasal breathing.

Mouth breathing being unavoidable in these cases, the constant pressure of the air inside the buccal cavity, gradually but surely forces the palate upward. From the simple vaulting of the plates in the very young, it may go on and lead to marked deformity of the jaw and great irregularity of the teeth; the central incisors suffer the most, being in some instances rotated to such a degree that they stand at almost a right angle to the jaw. Many a child has had one or more healthy teeth extracted and worn for months an ingenious mechanical device for correcting a crowded and irregular denture, while atmospheric pressure was constantly working against the efforts of the dentist. Whereas if the growth had first been removed the labors of

Digitized by Google

the dentist would have been lessened, since by establishing free nasal breathing, the undue atmospheric pressure would be removed from the inside of the mouth and the teeth come more easily into place. The time to operate for the removal of these growths is from the age of a few weeks to that of sixteen years, the earlier the better for the patient; the operation is not a difficult one and when properly performed is not attended by any danger to the child. The growths do not re-occur. After their removal the beneficial results are at once seen, so pronounced as to be truly wonderful. The breathing at once becomes quiet and regular, the mouth remains closed, the lungs expand with the increased supply of air and the whole physique immediately responds in a marked degree. The child hitherto called dull and stupid, now makes rapid progress, and his comrades soon cease making a laughing-stock of him, in fact he is a different being.

As dentists we have ample opportunities to diagnose this disease, which, so simple in itself, may be said to be malignant in its results, and we should realize our responsibilities in the matter, since by our neglect to cause the removal of these growths there is a risk of permanent damage to important functions, which may embitter the subsequent lives of these little ones "no one of whom should perish."

DISCUSSION.

DR. THOS. FILLEBROWN, of Boston, Mass. Although not anticipating the honor, I am happy to say a word opening the discussion of so able a paper as we have just listened to. Specialists have given much attention to this subject during late years, and much benefit has been done to individuals and the community.

The nature and condition of the disease and the ill results which follow seem now well understood.

It is proverbial that what a person is not looking for is unlikely to be seen, consequently, as I have not made adenoids a special study, I have failed to observe them in many cases. Still, I am fully convinced that they are often

Digitized by Google

present when unsuspected, and are the cause of so many mouth troubles among children as described in the paper. This is also the cause of the conditions exhibited by so many so called thumb-suckers. One dentist made quite a series of observations and reported them as results of thumb-sucking. I am now suspecting they were the results of the presence of some growth in the pharynx.

I must differ somewhat with the paper in regard to the causes that produce the high vault and narrow arch. The atmosphere presses equally in all directions. There is no more pressure up than down, hence the roof of the mouth is balanced between the two, subject to the gravity of its own weight same as other parts. I conceive the cause of the trouble and also of the excessive length of that portion of many faces, to be, the weight brought to bear on the teeth and upper jaw by the weight and muscular action of the cheeks. The mouth being open so continually the occlusion of the under teeth is lost, and the upper teeth and alveoli are depressed by the weight bearing upon them. The high V-shaped vault is not so much the elevation of the median line, as it is the depression of the sides. This depression narrows the arch, crowds the incisors forward and causes them to overlap each other and form very disagreeable irregularities.

With the remainder of the paper I am quite in accord.

DR. E. S. TALBOT, of Chicago. I did not hear the first part of the paper, and therefore do not know what the subject was, but I did hear the last part with reference to adenoid growths and their relation to mouth breathing and deformities of the jaws. I do not know just what I ought to say at this time, for the reason that I have in preparation a book upon this very subject, but I might as well give the results of my investigations for the last twelve or fourteen years here for the first time as to wait for the publication of my book. I have made quite a study of adenoid growths and diseases of the nose, especially in relation to the development of the vault and the dental arch, and I shall have to differ with the essayist in regard to the causes of the high

Digitized by Google

vault, as she calls it, and contracted arch, and the results of mouth breathing. I will commence by saying that my investigations have shown that deformities of the nose, including defective septa, arrest of development of the mucous membrane, and of the turbinated bones, including adenoid growths, arrest of development of the face, and of the jaws, are all the result of the same cause. That is to say, a child born of neurotic parents, is either a neurotic or a degenerate, and about fifty per cent of the people walking our streets must be classed under either one of those two heads. In the individual born with the neurotic condition, there is an arrest of development, not of the nose, or of the jaws, but of all of these tissues together. One is not dependent upon the other. A person with adenoid growths does not have mouth breathing and high vault and the contracted arch as a result, but they are all due to the same cause. Frequently he has a contracted chest, husky voice, and a deformed dental arch. What seems to be a high vault is not a high vault. In over six thousand measurements I have found that those who have perfect arches have highest vaults, that is, the apparently high vault connected with the V and the saddle-shaped dental arch is not a high vault, but it looks high because of the contraction. What is understood as contraction is arrest of development. The arrest of development takes place at the sixth year, and that is the reason we have adenoid growths, hypertrophy of the mucous membrane, and deformity of the dental arch early in life. It takes place at that time because the brain has obtained its growth and is imperfectly developed. There are three periods in the life of the individual, the first period is from birth to the sixth or seventh year. Medical men say the seventh, I say the sixth. The next period of development is from the sixth year to puberty, at sixteen or seventeen. The third growth is from the sixteenth year on. The brain gets its growth, I mean the bulk of the brain, at about the sixth year, some earlier and some later. We have then the first development of the permanent teeth. I do not know nor does any one know why it is that the brain at that time

Digitized by Google

ceases to develop, why in the case of the idiot, who has an arrested development of the brain, and why in the case of a genius, a Paderewski or a Blind Tom, their brains cease to develop in certain directions at certain periods. That is something we do not know, and it will be many years before we do know why it is the case, but it is a fact that these conditions are noticed among degenerates and neurotics. You go to the specialists of these diseases of the nose and they will tell you that in about fifty per cent. they have these conditions, not always adenoid growths but always excessive development of the turbinated bones at that time.

DR. ANNIE F. REYNOLDS, of Boston, Mass. I have nothing further to say upon the subject. I am very glad to hear Dr. Talbot. There is one point I should like to make. I did not intend to state in my paper, if I did so, that adenoid growths caused directly these conditions. It was simply by the retardation of the development of the whole system through the body being starved for want of air which should develop the system thoroughly that these conditions were produced. I did not mean to say that adenoid growths alone caused just these conditions in the head to the exclusion of the rest of the body.

The following paper was then read:

PULPITIS CHRONICA IDIOPATHICA.

VON ZAHNARZT P. MACAROVICI IN JASSY, RUMANIEN.

Pulpitis chronica idiopathica ist eine Dentinneubildung.

Dieser pathologische Process entsteht auf dreierlei Arten:

1. Durch die Proliferation einer oder mehrerer Zellen des Dentingewebes, einen knotigen Auswuchs bildend, welcher einen Druck auf den Nerven der Pulpa ausübt. Diese Knoten bilden sich auf der inneren Wand der Zahnhöhle (Taf. 8. Fig. 5, d).

2. Durch eine Art Obliteration der Zahnhöhle wobei die Verwandlung der Pulpa in Secundärdentin von der Peripherie der Pulpa ausgeht, an ihrem Kronentheile beginnt und

Digitized by Google

sich gleichzeitig mit dem Dentin vereinigt bis zum Wurzeltheile der Pulpa hinab. Diesen pathologischen Vorgang findet man häufiger bei abgeschliffenen oder bei cariösen Zähnen (Taf. 8. Fig. 5, b).

Zuweilen nimmt diese Neubildung eine so grosse Ausdehnung an, dass sie eine Axe mitten in der Pulpa bildet (T. 8. Fig. 5, f) die sich manchmal so verdickt, dass sie die Wände der Zahnhöhlung berührt mit denen sie dann zusammenklebt, und somit die ganze Pulpa sich in ein weicheres Dentin als das normale verwandelt und die Zahnhöhle vollständig oblitterirt. Dieses war schon den Alten bekannt. (Berlin, Hunter, etc.) Solche Concremente sind nach manchen Autoren meistens nur bei von leichten Entzündungen affizirten Zähnen zu bemerken. (Witzel, Antiseptische Behandlung der Pulpakrankheiten, 1879; Wedl, Pathologie der Zähne, 1870; Bruck, jun., Beiträge zur Hystologie der Zähne, etc., etc.) Ich glaube auch bei intensiveren Entzündungen (s. S. 345).

3. Durch eine Neubildung, die in der Pulpa selbst stattfindet, mit den Wänden der Zahnhöhle nicht in Berührung kommt, sondern frei, sei es im Centrum oder an der Peripherie der Pulpa, schwebt (Taf. 6. Fig. 4, e). (Salter, Bruck, Árkövy.) Dieses kommt nur selten bei Zähnen vor, deren Kronenhügelchen gar nicht angegriffen sind.

Bertin war der erste der die Bemerkung machte, dass diese Neubildung zweierlei sei: eine *adhärente* und eine *freie*, und dadurch war er der Vorarbeiter für die Entdekungen Salters, indem er ihm erleichterte festzustellen dass diese Dentinneubildung ein *pathologischer Process* sei, obwohl Bertin sie nur vom anatomischen Standpunkte aus beschrieben hat.

Bertin sagt: Die Zahnhöhle ist nicht ganz leer, sondern mit einer weichen Masse angefüllt die aus einer Lymphflüssigkeit entsteht, und sich verdickt, jedoch ohne die Knochenconsistenz zu erlangen. Oft bildet diese Substanz eine harte Masse, die erst mit dem übrigen Gewebe nicht communizirt, sich aber später mit dem Dentin vereinigt (mit der Wand der Zahnhöhle). Blondin im Zahnarzt, 1848, p. 147. Deutsche Vierteljahrsschrift für Zahnheilkunde, 1882, p. 167.

Digitized by Google

Salter, wie schon oben erwähnt wurde, war der erste der die Dentinneubildung in der Pulpa als pathologischen Zustand betrachtet hat. In seinem Werke "Dental Pathology and Surgery" sagt er dass die Dentinneubildung eine Neuralgie verursache (Deutsche Vierteljahrsschrift für Zahnheilkunde, 1875, p. 419).

Da Salter sagt, dass die Pulpa sich in jedem affizirten Zahn mit Kalksubstanz imprägnire, so ist es fraglich ob er diesen pathologischen Process auch bei Zähnen gefunden habe, deren Schmelz durchaus nicht von Caries herrührt oder abgeschliffen war.

Herr Professor Sculy, in einer in der Jassyer Klinik gehaltenen Vorlesung über den durch einen Knochentumor entstandenen Ulcer, sagt dass die Tumoren und zwar nicht nur die oberflächlichen, sondern auch die intrabulären in der Tibia oder im Femur beispielsweise, Neuralgien verursachen können.

Die Alten hielten diesen krankhaften Zustand der Zähne für einen normalen, und was mehr ist als eine Wohlthat der Natur. Hunter drückt sich einigermassen so aus: durch die Destruction des Dentins, würde die innere Zahnhöhle der Luft ausgesetzt werden, wenn die Natur den Verlust nicht durch die Neubildung ersetzen möchte, welche Neubildung leicht von der älteren Substanz unterschieden werden kann, dadurch dass sie immer weich ist und in der Mitte der zerstörten Fläche steht. Dieser Zusatz neuen Stoffes ist quantitativ mit der äusserlich verlorenen Substanz gleich (Deutsche Vierteljahrsschrift für Zahnheilkunde, 1882, p. 163, aus J. Hunter's Geschichte der Zähne; aus dem Englischen, 1780).

Nach Hyrtl soll die Verknöcherung der Pulpa durch Ablagerung von Phosphor und harnsaueren Salzen die Ursache der Obliteration sein (Hyrtl, Anat., 1875, p. 599).

Wedl hat nachgewiesen, dass die Obliteration von Concrementen in der Adventitia der Gefässe herrühre; diese Meinung theilt auch Árkövy (Árkövy, Diagnostik, 1885, p. 98).

M. Heider und C. Wedl erzählen, dass M. S. Ryding Dentinneubildung auch in gesunden Zähnen gesehen hätte.

Digitized by Google

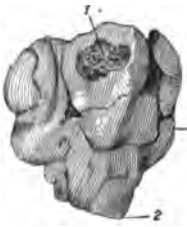


FIG. 1, TAFEL 9.

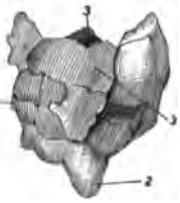


FIG. 2, TAFEL 9.

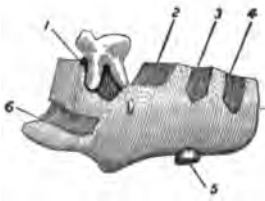


FIG. 3, TAFEL 9.

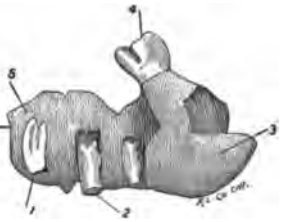


FIG. 4, TAFEL 9.

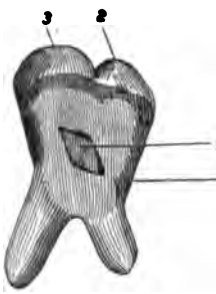


FIG. 5, TAFEL 9.

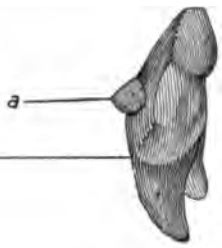


FIG. 6, TAFEL 9.

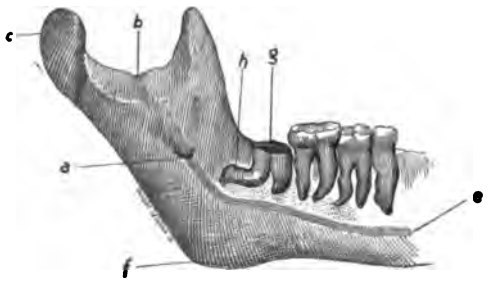


FIG. 7, TAFEL 9.

Digitized by Google

Sie selbst hätten sie auch in Milchzähnen mit durch den Zahnwechslungsprocess resorbirten Wurzeln wie auch in cariösen Zähnen gefunden (Deutsche Vierteljahrsschrift für Zahnheilkunde, 1864, p. 97; Wedl, Pathologie der Zähne, 1870, p. 932). J. Bruck, jun., sagt, dass er auch in gesunden Milchzähnen mit nicht resorbirten Wurzeln Dentinneubildung angetroffen habe, ebenso in bleibenden gesunden Zähnen und fügt hinzu, dass die Grösse der Concremente der eines Senfkornes gleich sei (Bruck, jun., Beiträge zur Hystologie der Zähne, 1871, p. 2).

Auch ich habe einen Fall gefunden in einem bleibenden, scheinbar gesunden, an der Krone nicht abgeschliffenen, nicht cariösen Zahn. Die Grösse der Neubildung war jedoch die eines Hanfkornes. (T. 9. Fig. 5, 6, a.-a.)

Frau G. wurde durch mehrere Jahre von Jassyer Ærzten wegen Kopfschmerzens behandelt, der sich auch auf eine Hälfte des Gesichtes ausdehnte. Die Behandlung blieb erfolglos.

Während der Ostern 1887 schickte Frau G. nach mir, denn sie fühlte zuweilen, dass der Schmerz in einem Zahne anfing, von wo aus er zur Hälfte des Kopfes und des Gesichtes überging. Sie erzählte mir dass bis vor einem Jahre pflegte sie dieser Schmerz zu befallen wenn sie eine schnellere Bewegung machte, z. B., wenn sie mit dem Fuss stampfte, den Kopf schüttelte, wenn sie hingegen sich ganz ruhig verhielt, blieb derselbe aus; zu jener Zeit dauerten die Schmerzanfälle nur ein wenig, und hörten plötzlich auf, als möchte man sie mit der Hand wegnehmen. In letzterer Zeit aber kamen die Anfälle, ohne durch irgend eine heftige Bewegung hervorgerufen zu werden, der Schmerz war viel stärker, und die Dauer desselben eine längere, als vorher. Zum Glück verschwindet er noch immer auf ein Mal und gönnt der Kranken für einige Zeit Ruhe.

Nachdem ich alle Zähne durch alle diagnostischen Mittel untersucht habe, fand ich keinen cariösen Zahn, auch durch Irrigation mit kaltem Wasser fand ich nichts.* Nur an der

* Anmerkung. Deutsche Vierteljahrsschrift für Zahnheilkunde, 1878, p. 26. Es scheint aber, dass dieses diagnostische Verfahren nicht immer stichhaltig sei. (d. Verfasser.)

Digitized by Google

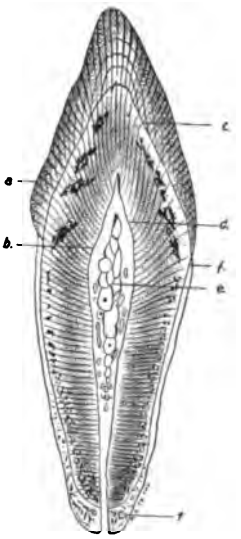


FIG. 4, TAFEL 6.

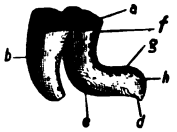


FIG. 2, TAFEL 8.

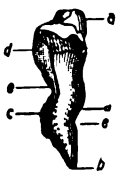


FIG. 3, TAFEL 8.

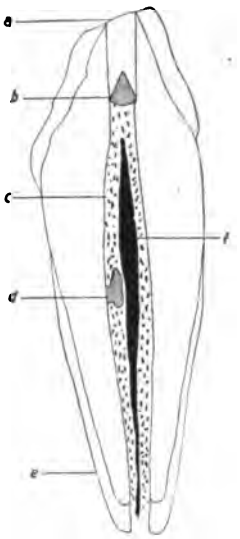


FIG. 5, TAFEL 8.

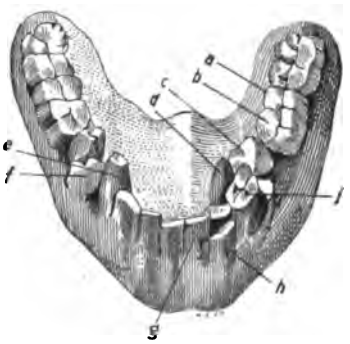


FIG. 4, TAFEL 8.

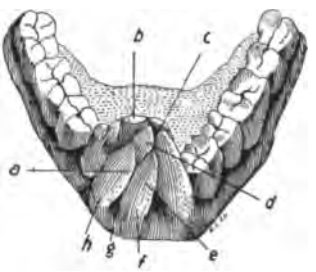


FIG. 1, TAFEL 8.

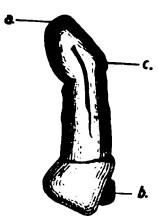


FIG. 2, TAFEL 6.

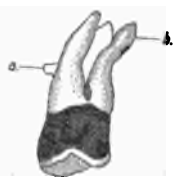


FIG. 1, TAFEL 6.

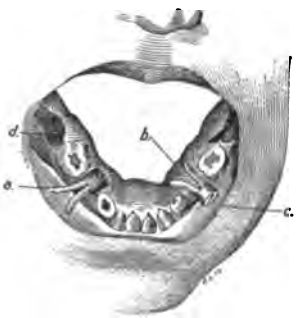


FIG. 3, TAFEL 6.

Digitized by Google

linken Seite des Oberkiefers fand ich ein wenig Calcul salivalis an ein Paar Molaren. Ich putzte die Zähne, entfernte den Zahnstein, und bestrich das Zahnfleisch mit Iodtinctur einmal täglich, ausserdem hiess ich sie viermal täglich mit in Wasser aufgelöster Borsäure den Mund ausspülen. Vier Tage hinter einander befolgte sie meine Vorschrift, aber ohne Erfolg.

Ich dachte an die Möglichkeit der Dentinneubildung in Zähnen mit unbeschädigtem Schmelz, und da ich bemerkte, dass der erste, obere, linke Molar sich in der Farbe von den anderen Zähnen unterschied, versuchte ich das Glätten der oberen Lippe nach Árkövy's Methode (Árkövy, p. 95), und die Kranke gab den Schmerz durch einen lauten Schrei kund.

Als ich diesen verdächtigen Molar noch aufmerksamer untersuchte, konnte ich bemerken, dass derselbe sehr wenig, kaum wahrnehmbar wackelte. Ich erklärte darauf der Kranken dass manchmal eine Ablagerung von Kalksubstanzen in dem Mark der Zähne vorkomme, welche Kopfschmerz verursacht und durch Perforation des Zahnes geheilt werden kann. Die Patientin aber die schon der verschiedensten Behandlungsweisen wie Kalium bromatum, etc., überdrüssig war, erklärte mir bereit zu sein selbst alle Zähne ausziehen zu lassen, wenn sie auf diese Weise nur die schreckliche Krankheit los werden könnte. Ich zog ihr somit den oberen linken Zahn aus (den verdächtigen Molar) und der Erfolg war ein vollständiger, denn seit jener Zeit bis auf den heutigen Tag hat die Dame nichts mehr gelitten.

Der extrahirte Molar hatte drei gespreizte resorbirte Wurzeln. Die Länge der Gaumenwurzel war 7 mm., die der mesialen 7 mm., die der distalen 5 mm. Als ich ihn spaltete fand ich die Pulpa verknöchert, um dieselbe war ein wenig Flüssigkeit zu sehen, in der Kronenhöhle zur Gaumenseite hin, während die verknöcherte Pulpa selbst in dem Kronentheile mit den zwei Labialwurzeln geblieben ist. Die ossifizirte Pulpa war nicht in Berührung mit der Wand der Zahnhöhle, sondern zwischen beiden war ein kaum sichtbarer Raum aus dem ein wenig weiss-gelbliche Flüssigkeit ent-

Digitized by Google

strömte (die noch nicht ossifizirte Pulpa), und die ossifizirte Pulpa war nur befestigt durch ihre Ausläufer, welche in die Höhlungen der Zahnwurzeln eindrangen. Die Farbe der Neubildung war weiss-gelblich mit einem Perlmutterglanz, die Form unregelmässig mit mehreren Kanten. Die Grösse war die eines Hanfsamens.

Ich werde mich hier nicht mit der hystologischen Beschreibung der Concremente befassen; diese werde ich in einem anderen Capitel ausführlich machen. Jetzt will ich von der Ætiologie dieses pathologischen Zustandes sprechen. Erst werde ich aber die Formation des Dentin und des Schmelzes resummiren.

Nach einer Analyse von Hoppe-Seyler wurden an dem Schmelz des Neugeborenen 15.59 % organische Substanzen gefunden. Der Schmelz bei Erwachsenen enthält nur 1–3 % organischer Stoffe, dagegen mehr Phosphorsaueren Kalk (Lehrbuch der Zahnheilkunde von Dr. Joseph v. Metnitz, 1891, p. 44). Es folgt also hieraus, dass junger Dentin weich ist.

Nach C. Wedl und M. Heider findet man in der Dentinneubildung unter Anderem auch eine Dentinemail (Schmelz) und Cementbildung (Deutsche Vierteljahrsschrift für Zahnheilkunde, 1864, p. 101).

Nach Fort ist das Dentin eine amorphe Substanz welche auf einer Section nach der Länge des Zahnes eine Menge kleiner Löchelchen zeigt, die Öffnungen der Dentincanälchen welche sich gegen die äussere Fläche des Dentins anastomosiren und manche sogar in den Schmelz eindringen. Andererseits lassen die Schmelzfasern zwischen einander gewisse Räume, deren Richtung dieselbe ist wie die der Dentincanälchen, so dass sie diese Canälchen verlängern. Die Dentinfasern oder die Tomeschen Fasern gehen von der der Pulpa zugekehrten Dentinwand aus, dringen in die Schmelzsubstanz ein indem sie durch die Dentincanälchen durchziehen (Fort, Anatomie, Tome Iier, 1887, p. 539–540). (Taf. 6. Fig. 4, a, b.)

Die bis nun von mehreren Autoren genannten Dentin oder Tomesche Fasern im normalen Zustande, solange sie

Digitized by Google

nicht mit der Luft in Berührung kommen, sind, meiner Meinung nach, *nichts anderes als eine Lymphflüssigkeit, welche von der Pulpa ausgehen, die Dentincanälchen traversiren und auch in den Schmelz und Cement eintreten, und dienen zur Ernährung des Dentins und des Schmelzes, und tragen theilweise auch zur Ernährung des Cementes bei, worin sie als eine Beisteuer des alveolaren Periostes betrachtet werden können. Diese Flüssigkeit bekomt durch die Kalksubstanz die Eigenschaft sich in Berührung mit der Luft zu solidifiziren, nur während sie die Dentincanälchen von der Pulpa zum Schmelze durchstreifen. Im Augenblicke aber wo sie mit der Luft in Berührung kommen, solidificiren sich die Lymphflüssigkeiten an ihrer Oberfläche, ein elastisch und mit kleinen Poren versehenes Häutchen bildend welche das Ausschwitzen eines kleinen Theiles der noch flüssig gebliebenen Lymphe ermöglichen, und die im Falle einer Zahnfractur zur Bildung des Calus dient. Mit der Zeit geht aber die Solidification vorwärts, bis auch die Poren verschwinden.* Diese Solidification erstreckt sich über die ganze Länge der Dentincanälchen, (für mich Lymphcanälchen), vom periferischen Ende bis zu ihrem Ursprung in der Pulpa.

Ich hege die feste Überzeugung, und ist es auch mehreren Autoren bekannt (Heider, Wedl), dass die innere, der Pulpa zugekehrte und dieselbe umgebende Dentinwand, noch nach der vollkomenen Ausbildung des Zahnes wächst; und also durch eine zu grosse Blutzufuhr infolge einer moralischen Emotion oder einer heftigen Bewegung u. dgl., also eine Hyperämie verursachen die vom Blute herbeigeführten mineralischen Stoffe eine Hypertrophie des Dentins welche eine Verengung der Dentincanälchen an ihrer Öffnung an den die Pulpa umgebenden Wänden zur Folge haben und ein Hinderniss zum Eindringen und Traversiren der Lymphe verursacht (Tomes Fasern). In diesem Falle speichern sich die Mineralsubstanzen in der Pulpamasse im Innern auf, welche sie wie im Normalzustande evoluiren, indem sie sich in Dentin, Cement und Schmelz verwandeln, die unter einander vermengt sind, oder sich zuweilen in Gruppen von einzelnen oder mehreren gleichartigen Zellen anhäu-

Digitized by Google

fen. Dieses wird durch die Beobachtung einiger Autoren bestättigt, welche sagen dass sie im neugebildeten Dentin Schmelz, Dentin und Cement gefunden haben (Heider und Wedl, Deutsche Vierteljahrsschrift für Zahnheilkunde, 1864; Wedl, Pathologie der Zähne, 1870; Bruck, jun., Hystologie der Zähne, 1871).

Dieses ist auch die Ursache, wegen welcher die Autoren finden, dass neugebildetes Dentin weicher ist als die Fundamentalsubstanzen, denn es hat die Reife noch nicht erlangt, und ein Beweis dafür ist die Thatsache, dass der normale junge Schmelz auch eine weichere Consistenz als der erwachsene besitzt, laut der Analyse von Hoppe-Seyler die ich oben angeführt habe.

Obwohl bis jetzt Lymphgefässe in der Pulpa noch nicht nachgewiesen worden sind, ist es jedoch sicher, dass Lymphflüssigkeit in der Pulpa vorhanden sein muss (J. Bruck, Lehrbuch der Zahnheikunde, 1861, p. 24–26).

Für diese Theorie der Flüssigkeit der Tomeschen Fasern spricht auch die Calusbildung nach einer Fractur der Zahnkrone, denn woher diese Calusbildung wenn nicht von der Secretion plastischer Lymphe? Und wenn die Bruchstücke der Krone in sich selbst keine Flüssigkeit enthielten, wie könnte die Lymphe, welche vermuthlich von der Pulpa kommt, diese Fragmente vereinigen, welche dann gegeneinander fremde Körper wären?

Diese Theorie erklärt auch die grosse Empfindlichkeit der Kranken, welche über einen bedeutenden Schmerz klagen, wenn man mit einer spitzigen Sonde einen Punct auf der Vereinigungslinie des Dentins mit dem Schmelze berührt, während diese Empfindlichkeit viel stumpfer ist an irgend einem Puncte des Dentins selbst. Der Druck der Sonde theilt sich durch das elastische Häutchen der solidifizirten Fläche der Lymphcanälchen der Flüssigkeit mit, die sich unterhalb befindet und von hier zu den Pulpanerven.

Die oben erwähnte Hyperämie die eine Pulpaentzündung verursachen kann, bestimmt den Ort der Dentinneubildung, und zwar ist die Entzündung eine so intensive, dass sie die ganze Pulpa interessiert und nur die Wurzeldentincanälchen verengern, die Concremente schweben in diesem Falle frei in derselben und sind von verschiedener Grösse und Form (Taf. 6. Fig. 4, e); ist aber die Entzündung eine geringe, so beschränkt sie sich nur auf manche Stellen der Pulpa, der Spitze, oder den Seitenwänden derselben. In diesem Falle

Digitized by Google

werden auch nur die Öffnungen jener Dentincanälchen verengert, die der entzündeten Stelle entsprechen, und das neugebildete Dentin lagert sich dort ab, und bildet eine Masse mit den Lymphcanälchen sowohl, als auch mit den Dentincanälchen. So entsteht Salters Secundärdentin (Taf. 8. Fig. 5, b).

Die oben erwähnte und auseinander gesetzte physiologische Rolle der Lymphflüssigkeit der Pulpa haben schon die Alten geahnt. Aëtius (450 v. Ch.) meint, dass die Zähne bis ins Alter durch die Ansammlung eines nervösen Fluidums wachsen, welches sich in ihrem Inneren bildet. (Prof. Blondin, Zahnarzt, 1848, p. 114.) Thatsache aber ist es dass nur die innere Dentinwand von der Lymphflüssigkeit wächst, der Cement von ihr nur eine Beisteuer zur Ernährung erhält, während der Schmelz von dieser Flüssigkeit nur eine Aushilfe borgt, damit er durch den Kauact nicht zu schnell abgeschliffen werde.

Daher wird Secundärdentin bisweilen auch bei Zahncaries angetroffen, weil diese Caries auch von dieser Ursache herrührt. "Es entsteht eine leichte Entzündung an der Zahnpulpe, an irgend einem Puncte, dem ein Punct an der Aussenseite der Zahnkrone entspricht, wo Speisereste leicht aufgenommen werden können, z. B., an den mesialen, distalen, labialen oder lingualen Flächen, sogar auch unter den Fisuren der Kronenhügelchen eines Backzahnes, da die Speisereste durch den Kauact nicht weggefegt werden können. Durch diese Entzündung der Pulpa wird an dieser Stelle die amorphe Masse des Dentins hyperplasirt. Die Dentincanälchen werden derart verengert, dass sie keine Spur von der Lymphflüssigkeit durchlassen, der Email wird an diesen Puncten von der Lymphflüssigkeit nicht genährt werden können, und wird durch den Kauact bis zum rohen Dentin abgerieben, wo sich mehrere Speisereste anhäufen. Durch die Fermentation dieser Speisereste löst sich das Gelatin, besser gesagt, die Knorpelsubstanz des Dentins auf, und daher entsteht die Zahncaries, darum finden die genannten Autoren bei dieser Caries ein Ersatzdentin."

Entsteht aber, wie schon erwähnt, die leichte Entzündung an den peripherischen Teilen der Kronenhügelchen eines Backzahnes, oder an der Peripherie der Pulpaculminationen der Incisiv- oder Caninzähne, so kommen diese Secundärdentinneubildungen wie in Taf. 8. Fig. 5, b, vor; dabei wird die Krone durch den Kauact nur gradlinig abgeschliffen, so dass sie keine Speisereste aufnehmen kann.

"Beim Zahne, dessen Beschreibung ich hier gebe, war

Digitized by Google

dies nicht der Fall, die Entzündung der Pulpa war eine intensive, die Osteodentinablagerung hatte in der Mitte der Pulpa stattgefunden, wie oben erwähnt wurde, und sich allmälig aglomerirt, eine gewisse Stärke nach abwärts mehr angenommen, so dass die Wurzelteile der Pulpa am Processe der Verknöcherung schon teilnahmen und durch die Intensität der Pulpaentzündung an den Wurzelteilen, dia Wurzeldentincanälchen derart hyperplasierten, dass die Lymphflüssigkeit als Mithilfe für die Ernährung des Wurzelcementes nicht mehr durchdringen konnte, es geschah, dass der Alveolarperiost die Resorbtion nicht mehr zu ersetzen vermochte, und eben darum fand ich die Wurzeln resorbirt." Meine feste Überzeugung ist auf die Anamnese der obengenannten Patientin gegründet, denn sie versicherte mir, dass sie nie in ihrem Leben die leichteste Geschwulst gehabt hätte, nicht einmal an einem oder dem anderen Kiefer und um so weniger an dem oben erwähnten Zahne. Dass der Zahn an seinen Kronenhügelchen noch unbehelligt war, erklärt sich dadurch, wie schon oben erwähnt, dass ich in dem die Dentinneubildung umgebenden oberen und seitlichen Raume noch genug Lymphflüssigkeit fand, welche den Email noch genügend nähren konnte, obwohl die Patientin an Neuralgie litt.

Eigentlich finde ich, "dass eine Neuralgie entsteht auch durch eine Hyperplasie des Cementes, (die sogenannten Exostosen), meistens an der Wurzelspitze localisirt (s. Taf. 6, Fig. 1, B; Fig. 2, a, c), manchmal aber auch an der Seitenwand der Wurzel, wo sie dann eine horizontale, dornartige Spitze bildet, (Taf. 6, Fig. 1, a), dadurch entsteht ein Druck auf die innere Wand der Alveole, wodurch der Alveolarnerv irritirt wird, und vielleicht später einen Ulcer des Zahnfleisches provocirt," gleichartig der Meinung des Professors Dr. Sculy.

Diesen Process finde ich nicht nur bei cariösen Zähnen, sondern auch bei scheinbar gesunden Zähnen. Leider haben die Patienten zu uns rumänischen Zahnärzten so wenig Zutrauen, dass wir solche Zähne nicht aufbewahren können, da die Patienten dann behaupten, dass wir ihnen irrthümlich einen gesunden Zahn ausgezogen hätten, und wollen den Zahn nicht geben.

Die obenerwähnten Neuralgien, die durch Ersatzdentinneubildung hervorgerufen werden, sollen meistens bei cariösen, sehr wenig aber bei abgeschliffenen Zähnen nachgewiesen werden können; denn es kommen mir viele Patienten anderer Krankheiten wegen vor, deren Zähne bis auf den

Digitized by Google

dritten Teil der Zahnkrone abgeschliffen sind und dennoch keine Neuralgie leiden.

Auch ich selbst besitze alle meine Zähne abgeschliffen und leide an keiner Neuralgie. Aber es sind doch Fälle da wo bei halbabgeschliffenen Zahnkronen Neuralgie vorkommt.

BESCHREIBUNG DER FIGUREN, DIE NICHT ZUM ARTIKEL GEHÖREN.

Die gekrümmte Original-Zahnwurzel von Taf. 8, Fig. 2, zeigt auch in Taf. 9, Fig. 7, wie er im Unterkiefer nahe neben der Artera Maxilaris interna berührt.

Fig. 3 und 4, Taf. 9, ist ein eliminirtes necrotisches Stück des Unterkiefers, den ich bei einem fünfjährigen Mädchen entfernte. Im Innern des Originalstückes finden Sie die permanenten Incisiv, Canin, und kleine Backzähne, die in meinem Werke beschrieben sind.

Taf. 8, Fig. 1 enthält auch ein Gypsmoulage, den ich von einem 60jährigen Manne abgenommen, der noch lebt.

Taf. 8, Fig. 4 sammt dem Gypsmoulage zeigt eben gedrängte Zähne, wie bei einem 20jährigen Jünglinge der Milchmolar zwischen den permanenten Incisiv, Canin und zwei Buccalzähnen stehen geblieben ist und alle Zähne sehr gedrängt sind.

Diese zwei: Figuren 1 und 4 gehören zur Physiologie in meinem Werke.

Taf. 9, Fig. 1 und 2 ist ein halber Knochentumor; ich entfernte ihn an Stelle des Weisheitszahnes bei einem 20jährigen Mädchen, das mir Dr. S. zugeschickt hat. Dieses ist im hystologisch-pathologischem Teile meines Werkes beschrieben.

Taf. 6, Fig. 3, gehört zur Physiologia-Pathologica meines Werkes. Diese Figur hat kein Gypsmoulage, sondern ich habe sie aus Joseph v. Metznitz's Werke entnommen.

DISCUSSION.

Dr. JOHN E. GREVERS, of Amsterdam, Holland. In opening the discussion of the paper we have just heard, I must confess that I am somewhat disappointed. The first thing that struck me was the absence of any reference to the work that has been done by the Odontological Section of the International Medical Congress, held in Berlin in 1890, where the subject was treated by Drs. Weil, of Munich, and Hamer, of Amsterdam. No reference has been made by the essayist to the new name that has been adopted for the hard formations in the dental pulp, as suggested by Prof. Iszlai, of Budapest, viz., odonthele. It certainly would have facilitated discussion, as there is a difference between odonthele and the hard concrements as found in the dental pulp. We even miss a differential diagnosis, and very little is said about the subjective symptoms of the disease. Now, it is well known that when there is pulpitis present with the hard formation, the tooth is highly sensi-

Digitized by Google

tive to thermal and to chemical changes; even cold air produces a paroxysm of pain. Very often the tooth shows no pathological changes whatever. The only thing that strikes an ordinary observer is a slight recession of the gums at the labial, buccal or palatine surfaces.

Adjourned.

THIRD SESSION.

On Wednesday, August 16th, the Section was called to order in the absence of the chairman, by Dr. J. D. Patterson, of Kansas City, Mo. The paper by Dr. W. D. Miller, of Berlin, Germany, having been referred to this Section by the general session, was passed.

The following paper was read:

THE RELATION OF PREDISPOSING CAUSES (SO CALLED) TO THE ACTIVE CAUSES OF DENTAL DECAY.

By L. C. Ingersoll, A.M., D.D.S., Keokuk, Iowa.

Dental pathology presents one aspect that at once arrests the attention of mankind—one fact of common experience and universal observation which is made the basis upon which the dental profession is built, viz.: The fact of dental decay—no dental decay, no dental profession. Had there been no gradual wasting away of the dental organs, with the attending pain, mortification of pride, change of facial expression, modification of features, and the early heralding of the infirmities of old age, the dental profession would never have come into existence.

At the very portals of dental pathology we are confronted with the difficult problem of the Ætiology of Dental Decay. The subject is commonly presented under two heads—*exciting* and *predisposing* causes. The use of the term predisposing causes is open to criticism. The relation of causation to results is that of effective means acting to produce the results. Webster defines causation to be "The act or agency

Digitized by Google

by which an effect is produced." Mere passivity cannot be a *cause*, for a cause implies activity adapted to produce certain results. Mere presence and passivity may be conditions affecting the operation of active causes, and such is the view that should be taken of what are commonly known as *predisposing causes* of dental decay. They are simply pre-existing bodily conditions, functional habitudes, peculiarities of internal structure or external forms which are favorable to the initiation and development of disease.

In approaching the subject of pre-existing conditions affecting dental decay, the greatness of the task of presenting a comprehensive view is at once evident and forestalling. I shall not, therefore, attempt it; for it would embrace a complete history of an individual, reaching back over many ancestral lines, inquiring into inherited idiosyncrasies, climate, habits and intellectual exercise, habits of diet, personal cleanliness, general environment, and the effect of every extraneous influence that could in any way enter as a factor into tissue and organic development.

Sufficient for my present purpose to know that every tissue of the body, whatever its general law of physiological development, has come to be what it is through various modifications of its typical nature and has received an impress peculiarly its own, derived from a great variety of sources. Hence it is that individual plants, animals and men, of a general class or species, have a nature *sui generis*.

Into the midst of these modifications of typical forms and the peculiarities of structure and function we are thrown to discover the conditions favoring or restraining dental decay, and to learn, if possible, to what extent pre-existing conditions are responsible for the exciting or active causes of decay accomplishing their results.

It was a great step forward in accounting for dental decay when investigations were undertaken to discover the effect of organic germs in the destructive work of disorganization. What had long been a mere presumption became a demonstrated fact—that micro-organisms are a potent factor in breaking down the hard-tooth structures.

Digitized by Google

Many became ready to renounce all other theories and demonstrations touching the subject and to hail the new discoveries as so overwhelmingly proven that, in spite of the ridicule of some, the existence and working of micro-organisms in the teeth became the most interesting of all subjects presented before dental societies, and almost every member who had any love for investigation and experiment had his microscope, his incubating medium and culture tubes. And finding that millions of organic germs, vegetable and animal, had domiciliated themselves in the inner spaces and cavities of the teeth, he wondered that the whole human family did not at once succumb to the fate of King Herod of old, of whom it is recorded, "He was eaten of worms, and gave up the ghost." Every dental journal was so full of the talk about bacteria, that the germ theory was almost the only topic of conversation among intelligent dentists, and the influence of the teaching was so wide spread and so deeply impressed that few thought of anything else in relation to ætiology, whether pertaining to the hard or to the soft tissues, than the potent influence of bacteria.

The atmosphere was examined, and found to be full of sporadic germs. The water drank, whether at the quiet country home or at the city hotel, was pronounced to be literally swarming with living infusoria, perpetually multiplying by germination, and with astonishing rapidity. Carpets, upholstery and draperies were declared to be but hot-beds for the breeding of disease germs. Soiled hats, handkerchiefs and gloves were believed to hold in them the seeds of contagion. The market place was declared to be a place of danger. Contact with the people, and whatever a soiled human hand had touched, was thought to be infectious. A lecturer on *physiology* and *hygiene*, in the town where I reside, went into the market and bought butter, cheese and sugar, and placing samples on the platform of his microscope exhibited to his auditors the active animal life disporting itself in the brown sugar, wriggling with an air of comfort in the cheese, or nestling with a home-like feeling in the butter, although nothing of the kind could be

Digitized by Google

seen without the microscope. Many left the lecturer's microscope with disgust, and wishing to vomit up all they had eaten of butter and cheese for a year, and declaring that they would never allow another particle of brown sugar to enter their stomachs, although like articles of food had been harmlessly used in the family for many years.

The newspapers took up the report of the scientific journals of bacteria finding a safe harbor in the mouths of people, undisturbed by pick and brush. Cases of inoculation by dental and surgical instruments were published with many terminal exclamation points. Misers were warned of their danger from the insidious microbe clinging to both coin and paper money, and all classes of people were inclined to look upon money as "filthy lucre" indeed.

An influential employe in one of the largest dry-goods houses of Chicago, with an air of alarm and great earnestness, said to me that he never allowed himself to carry in his pockets any dirty money; then took out his wallet and showed me that it only contained fresh clean bills right from the government press.

The tocsin of alarm was sounded in the last Congress of the United States by an appeal made from the floor of the senate chamber for an order from the government that all soiled paper money should be burned and its place supplied with clean bills.

This wild alarm, this excited craze, would never have been created, had the exact truth kept pace with swift-winged error. The error was in the false conclusions hastily arrived at by the great mass of community, that all aeriel and aqueous germs are disease-provoking, if not actually poisonous—that if organic germs have life at all, and enter with air, food and water into our bodies, they must be the cause of disease. Whereas, if it could only be known just how many kinds of organic germs are pathogenic in their character, the number would be found to be most astonishingly small compared with the countless millions that float in mist and air harmlessly around us, or innocently locate themselves in the fluids or in the more solid tissues of the body, and

Digitized by Google

for aught we know giving us vigor rather than doing us harm.

It is not strange, therefore, with all the talk and excited interest that has been aroused concerning the history, habits and work of bacteria, and the numerous demonstrations that have been given of their destructive work upon human teeth, that the profession should overestimate the work of micro-organisms; forgetting, for the time being, the conditions that restrain the active working of bacteria.

There seems to be an abiding impression in the minds of some that if bacteria are found in the mouth, they must exercise a destructive agency upon the teeth, and that prophylactic antisepsis is absolutely essential to prevent decay.

The chemical theory of decomposition in penetrating the enamel as a primary process of decay is accepted by bacteriologists. In fact, the chemical theory of the decomposition of the mineral portions of teeth must be accepted from first to last of the process of decay, the only change apparent being in the source of acid supply; in the one case it being from decomposition of organic matter, resting upon the surfaces of the teeth, and in the other case, the acid being elaborated by the bacteria. But why should it be thought necessary to abandon a theory of decay by vegetable and mineral acids chemically produced when accepting the theory of decay by acids produced by organic germs? It is chemical decomposition in either case, with the additional destructive work of the bacteria gaining their food supply by devouring a portion of the organic matters composing, in part, the substance of the teeth.

With this brief notice of the active agencies employed in disintegrating and dissolving tooth substances, let us next inquire into the relation of, so called, predisposing causes to the exciting and active causes of dental decay. Is the relation such that when the active causes are present in the mouth decay of the teeth is inevitable? From what we know of oxygen, we know that when it comes in uninterrupted contact with base metals, it corrodes them. From what we know of the agencies that destroy human teeth, is

Digitized by Google

it certain that their presence is a sure prophecy of tooth destruction? Are there any pre-existing conditions and tendencies that restrain active causes? Are these favoring or restraining influences inherent in the nature of tooth structure, or are they accidental and artificial?

We know that while metals, for the most part, are oxidizable, such metals as platinum, gold and aluminum are practically free from oxidation—that while common iron rusts with great rapidity Russia iron, in the same circumstances, will be practically free from rust. The reason for this difference in the oxidizable tendencies of metals must be found in the nature of the metals themselves—a restraining and antagonizing element inherent in their composition. Disease is from without; antagonism to disease is from within; and the strength of the antagonism depends upon the nature and functions of the tissue or organ. Different elements and in different proportion entering into the composition of substances makes one substance to differ from another not only in its physical aspects, but in case of organic substances, a difference exists in the antagonism set up against destructive influences by life itself. The fact that organic substances do not exhibit the same antagonizing resistance in the presence of destructive influence from without is evidence of a difference of elementary constituents; while the greatest of the differences is created by vitality, which resist chemical decomposition, there is, wholly independent of life, a great difference in the material structure which invites decay. Because of this difference of material composition, one substance decays, while in the same condition and subject to the same influences another does not decay. We see this illustrated in the mouths of individuals where there are some teeth that decay and others that do not decay; markedly, in case of contiguous teeth—two molars for example. Their proximal surfaces are subject to the same influences; one tooth decays, while the other shows no signs of decay. Both acids and organic germs may fill the intervening space, and only one tooth be acted upon while the proximal face of the contiguous tooth resists decay. No

Digitized by Google

other account can be given of this difference except the difference in the quality of the tooth tissues.

Such facts lead us to conclude that the ætiology of dental decay is not to be found alone in external influences, or chiefly in environment and active agencies from without, but also in the inherent nature of tooth substance—in a certain inherent impress and tendency gained in embryo and stamped upon the impressible protoplasm.

The impressibility of protoplasm is illustrated in tattooing, where an impress is made upon the cell elements composing the skin, causing a permanent change in the functions and habit. The same is illustrated in the formation of cicatricial tissue in which a new form of tissue results from violence received by the Malpighian layer of cells causing them to deviate from their normal production of tissue and to form a new kind of tissue, and to continue that deviation through the life of the individual.

These examples are illustrations of the potentiality of germ life and of the certain and permanent character of protoplasmic impressions. I have known a case where, in the mouths of three generations, the same tooth, correspondingly, decayed after adult life, while the contiguous teeth remained firm. I have also known excrescences to appear at an advanced period of life which, in location and form, were exact reproductions of what appeared on the person of the father when at the same age—the germ with its impress lying dormant for a period of about forty years: showing that in case of the son it was not produced by irritation, organic germs, or other external influences, but by inherited impress.

We may observe the principle illustrated in inanimate nature, where forest trees growing out of the same soil, in the same climate, subject to the same thermal influences, yet show different degrees of longevity and resistance to decay, whether dead or alive. The wood formed under like influences will show different qualities of resistance to decay under the same circumstances of exposure. If fence posts of different kinds of wood are put into the same kind of

Digitized by Google

ground, one will last five years, another twelve years, and another twenty or more years. In accounting for this difference in the period of decay of the different kinds of wood, no one thinks of attributing it to the greater or less development of fungi in immediate contact with the wood, but to the nature of the wood and its inherent power to resist the destructive ferments and the wasting agencies of fungi found in the ground. Cottonwood and oak have a different composition of fibre, and because of this difference the cottonwood decays early and the oak continues much longer. Red cedar has a very different elementary composition from oak, and the very same influences which waste the tissues of the oak have no effect upon the cedar.

The very same difference of conditions and results exists with reference to decay of teeth in the same mouth and in different mouths—a difference created by peculiarities of tissue rather than by bacterial influence.

Fruits grown in the same soil, receiving the same cultivation and placed at maturity in the same cellar, will show a marked difference in their tendency to decay, because of one kind being a fall apple and another kind a winter apple.

It is sometimes said that if teeth are only kept clean they will not decay; for the reason that filth is a microbe harbor and a laboratory for the preparation of elements that act chemically upon the teeth. Yet, in the very face of this teaching, we find teeth that are kept clean to the extremest limit of practicability, that decay early and rapidly; and on the other hand, we find teeth that are never cleaned from month to month, yet retain their firmness of substance to a good old age, in spite of the microbe.

The history of the microbe is the same as that of animal life everywhere. Food supply is essential to life support. His location is one of chance, not of choice. If he chance to enter a mouth where decomposition is already prevalent, liquifying organic substances for his food, he can set up housekeeping immediately and propagate an immense family. But if no such condition exists, the law of self-preservation compels the microbe to elaborate an acid and

Digitized by Google

enter upon the work of dissolving whatever hard substances he has access to which contain the nutrient element that he needs. If such exist in the teeth, the tooth substance is dissolved. Plant life exhibits the same great fact of life support. If organic ferments and the solvent properties of water fail to supply the plant with the nutrition it needs, it will exude from the covering of its roots, and acids that will dissolve lime-rock, silex and all minerals and metals needed to supply its food elements. If a proper supply can be obtained, the plant lives; if not, it dies. The microbe succumbs to the same fate under similar circumstances. No doubt millions of organic germs, not finding a congenial field for their support, die of starvation. Multitudes of others die because, having reached the end of a limited existence, like the millions of ephemera that infest the air, covering the face of nature like a veil, live one day and die.

As animals of a larger species prey upon each other, the stronger overcoming the weaker, and as plants of one species take possession of a field, and by vigorous growing monopolize the virtues of the soil, or by the peculiar nature of their waste products drive from the ground all other plants, so we may expect to find that one species of microbe will prove to be a lion and devour other microbes, or a baneful germ that will not allow other germs to prosper within reach of its baneful influence. The habits of life, whether exhibited by plants, animals or men, have many such striking analogies.

When the favoring and restraining conditions of dental decay are compared, it will be found that the latter far outnumber the former, and are far more potent in their influence.

Drinking water is thought to be one of the chief mediums for the transmission of disease germs. It is a demonstrated fact that whole families of children have been swept away by taking impure cistern water. Large districts in cities have been the localities affected by the use of well water from open wells receiving surface drainage. No doubt germs from the same source lodge in the mouth and affect the teeth. For the sake of curing the evil and arresting the

Digitized by Google

danger, it has been asserted by those whose opinions are thought worthy to be trusted, that all cisterns should be thoroughly cleaned and washed with some harmless antiseptic compound two or three times a year, and that all water used for drinking should be thoroughly boiled or otherwise sterilized.

Now I must confess, that as to this part of scripture, I am a little heterodox, both in theory and practice. While I accept the teaching that some cisterns become so foul as to need cleaning, all do not. I have a cistern holding from two to three hundred barrels of water, from which my family receive their supply of water. That cistern has not been cleaned out in fourteen years; nor would I have it cleaned out even if I could have it done without expense. I have no doubt that there is a sediment four inches deep at the bottom, made up of decayed leaves falling annually from near-by trees upon the roof and into the water pipes of my dwelling, together with dust and all atmospheric germs, beside an endless variety of microbes, living and dead. But I am not alarmed, the water is always pure and sweet, while some of my neighbors who frequently empty and wash their cisterns are having foul water about half the year. It is a very common remark of those who drink water from my cistern, "What pure water you have." Do not the compensations of nature and the antagonizing forces that restrain the active forces of decomposition, as I have presented them in this paper, explain how it is that the water is kept pure?

Rain water when it first enters the cistern is filled with all the impurities that float in the air and are washed from the water-shed. Then it undergoes a clearing process by fermentation, like the must of wine, the wort of beer, and the fruit juices that change to vinegar.

After the fermentation these turbid liquids are no longer must, wort and apple juice, respectively; but wine, beer and vinegar—all clear and pure liquids. The water undergoes a similar process of clarification.

A sea captain who had sailed the ocean for twenty years, told me that he could find no water on the face of the globe

Digitized by Google

that would keep so well as the water of the Mississippi River. This at first surprised me, knowing as I did, that this river is the drainage outlet of a vast flat country covered with decayed vegetation. He remarked, that it passes through a "curing" process, and thereafter remains pure for an indefinite length of time. The same is true of the water accumulating in a cistern. There are fermentable impurities sufficient to form a nucleus and invite organic germs which start the fermentation, and by fermentation the whole body of water becomes clarified, as vinegar, wine, cider and beer become clarified. So long as the vinegar plant is kept in the vinegar, and the lees in the wine, all is well. So by leaving the sediment in the cistern of water it performs the work of yeast and lees.

I have demonstrated the same principle in a barrel of water kept at my office through the entire summer, refilling from time to time with river water as I had need, but never emptying out the sediment—the water being kept uniformly pure thereby. These illustrations show the strict guard that nature holds over the processes of decomposition.

Were it not for the checks, restraints and compensating balances that nature holds over the retrograde processes by which organic nature returns to the original elements, the decompositions which are inevitable would depopulate the world in a single summer; and were it not for the restraints and antagonisms set up in the mouths of the human family, every tooth would melt down under the influence of decay within a year, and not one be seen in human jaws; and that, too, in spite of every practicable system of antisepticism that could be adopted.

On the contrary, we find individuals in whose mouths the conditions favoring decay—the so called predisposing causes—are so overmatched by resisting and restraining conditions, that decay of the teeth is prevented. This is the true *vis medicatrix naturæ*. A something that nature instills into structures to render them enduring and serviceable while life shall last. This is in harmony with the philosophy of life, and the demands of physiological functions. This is

Digitized by Google

nature's self-defense against destruction—a sure cure for dental decay. Antisepticism is not a cure. Prophylaxis is.

Here there meets us the grandest theme ever presented in dental literature or science—the prevention of dental decay. Not that prevention which arrests decay when its work of destruction is half done; but that prevention which does not allow the work of decay to begin; that prevention which establishes by hygienic law, a barrier in the very nature of tooth substance that will effectually resist all external influences; that prevention which reaches back to embryo life, and touches the protoplasmic germ and stamps it with longevity. We need less of cottonwood and poplar, more of oak and cedar in teeth—more of the resistance of platinum and gold in their natures. We need a better understanding of that dental hygiene that guards the very portals of life and nutrition, and forbids the entrance into the tissues of the teeth, of every element of weakness and decay. Then we may expect that teeth will bear on their faces the monumental records of a comfortable and happy old age.

DISCUSSION.

DR. H. W. MOORE, of Santa Barbara, Cal. We know that pathogenic germs, as of typhoid fever and tuberculosis, exist in the dust blown about the streets from expectoration and other sources. The same matter is taken into the cistern from the roof and in time is pumped up and we drink it, and if the system is predisposed to infection from those germs, we are affected by it unquestionably. The paper has a good bearing on the point that it is probably defects in the tooth structure that allow the admission of pathogenic and acid-producing germs to make their first inroads into the teeth. Healthy tissue is a germicide, and the only hope we have is to improve the physical condition of man. In that we have a great field before us. The germs we need to be afraid of in the decay of the teeth are putrefactive and fermentative. We need not fear the germs producing tuberculosis and typhoid unless they have a two-fold property—that of destroying the tooth structure also.

Digitized by Google

DR. W. J. MORRISON, of Nashville, Tenn. In regard to the germ theory in the production of caries, I certainly believe in it. Dr. Miller has done great service in investigating this matter, as much so in this direction as Koch or Pasteur have in their lines. As to the illustrations brought on one side, they can be met with equal ability on the other. One idea that may be conveyed by the paper I don't like. It has a tendency to convey the idea that cleanliness is not necessary; that antiseptic precautions are not necessary. He compares a tooth with iron and wood in its susceptibility. He illustrates by using the cedar, oak and cottonwood; but cedar resists atmospheric and chemical changes because it contains an oil, and that very oil has been applied to medicinal purposes as a preservative. As to iron which was referred to, there are some here who remember a few years ago when railroad men were very much exercised over the inroads of certain germs that threatened to destroy all the railroad iron. In certain localities it actually destroyed the iron rails. There are times when the atmosphere seems to be favorable to the propagation of these lower forms of animal life and when the system seems to be in a condition to propagate them. So with the teeth, there are those that are in a condition for the successful propagation of these forms of animal life.

As to cleanliness and the necessity for it. We all know that in the manufacture of vinegar, especially from fruit juices, if the juice is put into a clean barrel, in many cases it will not sour nor be converted into acetic acid, but there is a germ sometimes that takes possession of fermenting juices, and that is the germ of putrefaction which causes the juices to rot and not be converted to vinegar.

DR. E. S. CHISHOLM, of Tuscaloosa, Ala. The writer has touched upon a most vital point. Recent studies in bacteriology have not been carried on in the line which the original investigators had laid down. We have recently discovered bugs in everything, and if the condition of things are such as we are now taught, we would have been permeated with disease and the whole world have been dead

Digitized by Google

long ago. I do not wish to be understood as saying that bacteria do not play an important part in many things, but we have gone to extremes. I am willing to go on record as saying that acid plays a far greater part in the causation of decay than bacteria, and that the location of decay in the smaller cavities of the teeth is only the indigenous home of bacteria.

DR. MOORE thought Dr. Miller had proven beyond a doubt that acid is one of the products of bacteria.

DR. L. L. DAVIS, of Chicago, understood so well Dr. Ingersoll's position in regard to bacteriology that he did not for a moment intend to detract from it. He is simply calling attention to the fact that possibly some of us have been led a little astray in the study of bacteria, and that we should look to the fact that there are within our systems certain formations, call them what you will. He lays on one side common iron and on the other Russia iron. That is simply a matter of development or scientific process of preparation. Iron is the same in its component parts. As one gentleman has already said, we should look for the highest development of the species rather than go into the theory so far that we forget even the prominent points that must be ever kept in mind.

The following paper was read, in the absence of the author, by Dr. H. B. Noble:

ORAL PATHOLOGY.

BY R. FINLEY HUNT, D.D.S., WASHINGTON, D. C.

In offering this paper for your consideration, it is the intention to treat of but one of the many pathological conditions to which the oral organs are subject—a condition which, though brought from time to time to the notice of the profession in dental journals and association meetings, has not received that attention which its frequent occurrence and serious results demand.

It is that pathological condition of the oral mucous mem-

Digitized by Google

brane and subjacent tissues commonly known as the "rubber disease" or "rubber sore mouth."

It is true that to this day quite a number of dentists, some of them of considerable prominence in the profession, deny the existence of this disease as being produced by the wearing of rubber plates *per se*, yet the concordant testimony of such members of the profession of the last and the present generation, as Taft, Atkinson, Walker, Kulp, Dorrance, Allen, Eames, Cushing, Morrison, Roberts, Crouse, Flagg, Younger, Sturgiss, Judd, H. A. Smith, Haskell, J. C. Smythe, H. B. Noble and others, would seem to establish beyond controversy not only the existence of the disease, but its existence as a specific disease produced by a specific cause, viz., the wearing of rubber plates in direct contact with the mucous membrane.

This testimony can be obtained from the records of dental societies and associations, and from dental journals commencing about the year 1866, *i. e.*, soon after dental rubber plates came into use, as well as from those of the above named gentlemen who are now living.

But a small part of this testimony can be introduced in this paper, only sufficient to identify this as a specific disease, and to define its symptoms, stages and effects, as also the general method indicated by actual trial and experience for its prevention and cure.

Dr. W. B. Roberts, of New York, in 1866 thus describes it: "A great absorption of the alveolar and bony substance of the jaw; irritation of the mucous membrane—a condition nearly approaching salivation—gastric irritation; general derangement of health consequent upon such abnormal conditions. All these symptoms of disease were removing their obnoxious cause, red vulcanite, while a healthy condition continued after replacing it with gold or continuous gum."

Dr. L. P. Haskell, of Chicago, in the *Medical Journal and Examiner*, 1881: "To this testimony of Dr. Roberts has been added sixteen years of experience all over the world—we may say universally—of the dental profession, but doubt-

Digitized by Google

less there are many dentists who are unaware of these facts in relation to vulcanite."

Dr. Judd, of St. Louis: "Lady with full upper set; while filling lower tooth, accident revealed condition of membrane covered by plate, red and injected with blood, entirely unaccompanied with pain. Six months later returned complaining of 'uneasiness' in vicinity of horizontal plates of palate bones. Examination revealed ulceration of soft tissues and necrosed bone. Whole mucous membrane in state of active inflammation. Plate discontinued while under treatment. Metal plates substituted with no further trouble."

The same gentleman: "Man forty years of age. After wearing rubber plate without discomfort for nearly a year, found there was something the matter with the roof of his mouth, not on account of any pain, but because when drinking without his plate, water seemed in some way to get into his nose. Found inflammation extending to periosteum, thence to bone, resulting in the extensive necrosis of the palate processes of maxillary bones, involving considerable portions of the vomer, but presenting to the eye only the appearance of a phagedenic ulcer. Silver probe passed through in three or four places into the nose. Soft parts sloughed off entirely; remaining portions of processes also, leaving large openings from mouth to nose."

Dr. Judd gives several other similar cases in the *Missouri Dental Journal*, October, 1869, and adds: "But these cases are not so common that it would be useless to enumerate more of them." And further says: "I remember a lady in whose mouth the surface was rough, thrown up in granular masses like a strawberry, only purple instead of red."

Dr. Walker, of New Orleans, in the *Missouri Dental Journal* in 1874: "The rubber disease presents in its earlier stages a peculiar pallor of the parts of the mouth covered by the plate, and is accompanied by a thickened, slimy, unhealthy condition of the saliva. This is generally followed by the appearance of bright red spots, and then a general thickening and inflammation of the mucous membrane, fre-

Digitized by Google

quently extending to the throat, producing a disagreeable, tickling sensation and annoying cough. At the same time extensive absorption of the process takes place, and severely destructive necrosis of the palatine bones occur. In its worst stages the roof of the mouth presents the appearance of partially decayed beef cut across the grain. . . . . I have had in my own practice cases presenting each and every one of these features clearly traceable to the presence of a rubber plate, and disappearing with the substitution of other material when taken in time, although some cases have terminated in death from too late recognition by the patient of the cause of the disease."

Dr. G. H. Cushing, of Chicago, "has observed this disease only in the mouths of persons wearing rubber plates."

Dr. Kilbourne, of Illinois: "Two cases of poisoning from wearing red rubber. One was cured by substituting silver plate. The other had worn 'red rubber plate' (vulcanized very hard) some three months, with more or less inflammation, and greatly increased flow of saliva, and very general debility, running down so fast that she finally took to her bed and sent for her physician." He suggested that perhaps the rubber plate might be the cause, and advised her to leave it out. She did so and began to mend, recovering completely in a short time. Not fully satisfied that the rubber was the cause of the trouble, she placed it in her mouth again, with the same result as before in a greater degree. When she fully recovered (which took some three months) a gold plate was inserted, which she had worn three years without any recurrence of the former symptoms.

Dr. Crouse, of Chicago: "Case in which the membrane was greatly thickened and largely granulated, had the appearance of a strawberry, bled and caused loosening of the teeth. When plate was abandoned, the teeth tightened and membrane promptly reduced to half its former thickness." Dr. G. H. Cushing corroborated the description of the case, saying, "It was of most marked character. The mucous membrane around the margin of the plate was in as healthy condition as any I ever saw. It was diseased under the

Digitized by Google

plate only, and the whole surface of the mouth was granulated like a strawberry. It was red, and there was considerable tumefaction."

Dr. J. Curtis Smythe, of Washington, D. C., has now a case which, when it came into his hands, was one of marked rubber disease in a well advanced stage. The mucous membrane under the rubber plate worn (a partial set) was thickened, congested and granulated. He first tried making a new plate carefully adjusted without lining, but finishing the palatine surface by thoroughly polishing—without success. He then lined the plate with a gold lining, which restored the mucous membrane to a healthy condition. Subsequently another natural tooth was lost, and he replaced it with a porcelain one, without interposing the gold lining between the added rubber and mucous membrane. Now, the portion of the mucous membrane covered by the added rubber is inflamed and congested, while all the rest of the surface is in healthy condition.

As to the idea or belief, expressed more than once, that the diseased conditions above described were caused by want of cleanliness, Dr. Taft said, "The effect from wearing rubber plates is a very different thing, and is found in the mouths of persons the most careful and fastidious about cleaning their plates."

Dr. H. A. Smith also said that "during twenty years' practice, wherever he had found trouble under metal plates, he thought he could trace it to neglect and uncleanliness, but that the disease from rubber plates was found with the most scrupulous cleanliness in the care of the plates." Dr. Walker said in the American Dental Association, "Uncleanliness does not account for it, as it occurs in those mouths which are kept perfectly clean and in persons of refinement and culture." And in the Southern Dental Association he said again, that though "other materials do produce disease, the rubber disease is entirely different from the mere results of want of cleanliness."

Dr. Flagg thinks that "rubber poisoning is familiar to nearly every dentist." Dr. Younger, of San Francisco,

Digitized by Google

"believes it injurious in a large majority of cases." Dr. Sturgiss, of Illinois, "has never seen a mouth free from bad effects where red rubber was used." Dr. Taft puts it in the proportion of "nine cases out of ten," while Dr. Judd says, "be the proportion what it may, the fact that these results are frequent is established beyond all controversy by the testimony of the best men in the profession. My own observations accord with those of others in this respect."

Surely the evidence here presented, though but a small part of the great amount at command, does identify the pathological condition now under examination as a specific disease with distinct symptoms and characteristics, and does establish beyond controversy the fact that it is caused by wearing vulcanized rubber in direct, constant and adhesive contact with the mucous membrane in the mouth.

From the same evidence may be deducted its symptoms, stages and effects as follows:

A low order of vitality in the parts covered by the plates, a peculiar pallor of the same, irritation, swelling, redness, inflammation, congestive, gorged, hyperæmic condition, granulation—granulated masses like a strawberry—red, purple, scarlet, soft and spongy; half the arch filled with a spongy mass; blood oozing from the diseased parts; turgidity of the vessels; roof of the mouth like half-decayed raw beef cut across the grain; suppurating, discharging condition, ulceration; pus exuding from the folds; sanguinopurulent fluid constantly exuding from the apertures in the palate over the necrosed bone; sensitiveness so obtunded that no pain is felt, or in other cases a burning, drawing, feverish sensation; lines of inflammation extending to the throat, causing disagreeable tickling sensation, and annoying cough; bronchial affections, chronic catarrh, sloughing of the soft parts; in some cases death.

It is left for you to decide what must be the disastrous effects of such conditions of the tissues of the mouth, "that gateway of life," upon the other organs of the body, and upon the general health.

Should we not feel that a paramount duty rests upon

Digitized by Google

each and every member of our profession with a weight that should be irresistible to devote all our energies to the work of guarding and relieving our patients, who trustingly place their personal comfort, their health and even their lives in our hands, from this loathsome and often fatal disease? There can be no answer to this but an affirmative one.

Is it within our power to do this? The evidence adduced and referred to in this paper shows that when the lesions have not progressed too far, a cure has always been effected and a recurrence of the disease prevented in three ways, viz.: By discarding altogether the rubber plate; by substituting for it a plate of gold, platinum or even silver; and by interposing permanently between the rubber and mucous membrane a foil or thin sheet of metal. When the last method has been applied, using ordinary metallic foil, the effect has not been permanent, because the smooth surface of the foil in contact with the rubber allows it in a short time to separate from the rubber and scale off, leaving the rubber exposed, and to that extent in direct contact with the membrane. The foil or tin plate should be so prepared that while its surface presented to the membrane is smooth, its other surface in contact with the rubber is so roughened as to make union of the two permanent. The range of metals that have been found successful in relieving and curing this disease is wide—as gold, platinum, silver, tin and aluminum. The requisites most effective in the foil used are, as shown by experience, purity, cohesiveness, and a permanent union with the rubber. Gold, as at present prepared, best meets these requirements.

This disease possesses one characteristic, common to many others, and that is the difference in the degree of virulence with which it attacks different patients. With some it progresses to a fatal termination, while with others it seems to reach certain stages and there stop. These stages may be anywhere between total immunity and the final and fatal one, which is probably due to the diathesis or systemic condition of the individual wearer of unlined rubber plate. If so, there may be such fluctuation in the systemic con-

Digitized by Google

dition as to induce the virulent stages of the disease. It would seem, therefore, to be our duty to insist that every rubber plate (and people will wear rubber plates) when made should be equipped with the best lining obtainable, thus adopting in this matter that best of all systems, prophylaxis, and especially as we know that a pure metallic surface in contact with the mucous membrane will ward off the rubber disease.

Simply as a matter of taste and cleanliness, a gold-lined rubber plate is purer, brighter, sweeter and more cleanly than an unlined one.

It is hoped that this paper will be the means of attracting to this much neglected subject the attention and study which its gravity demands.

DISCUSSION.

DR. H. B. NOBLE, of Washington, D. C. We have been observing for years all these conditions noticed under the rubber plate, but if the profession feels as I do, it would wish there was no such thing as a rubber plate. I fear it will be a long time before rubber plates will be discarded; then let us put them in the best possible way.

I think that a pure gold-lining should be placed on all rubber plates in the mouth. It will stand, and we in Washington, the home of a good gold-lining, felt that the attention of the profession ought to be called to the fact that there was a substance which can be put on a rubber plate and make it better than without. I am happy to see that we are fast passing into the stage when only metallic substances will be used in the mouth.

DR. C. L. BOYD, of Eufaula, Alabama. I have noticed that the trouble referred to is almost always found on the ridge of the lower jaw, and for that reason I am led to believe that it is not so much from the rubber as it is from the movements of the plate and nonadaptation. I am glad to know we have a substance with which to line rubber, but do not think rubber should be condemned entirely. In many cases I have replaced rubber plates, using not red, but brown

Digitized by Google

rubber. In many cases I found the strawberry appearance to be caused by a bad-fitting plate. If the plate fits the mouth perfectly and the patient wears it six or eight weeks, treating the mouth with an antiseptic and afterward making the patient a second plate, you will find if the second plate is a perfect adaptation, if the teeth come together properly and there is no rocking, that the inflammation will in most cases subside. That disruption of the process and antral abscess are produced by rubber plates I am slow to believe, because we find this trouble in many cases where the teeth are in the mouth and the patient has never worn a plate. The worst case I have ever seen was in a mouth which had never known a plate.

DR. NELS NELSON, Chicago. I do not take sides with either of the gentlemen who have spoken. The rubber itself does not affect the mouth in any degree to speak of, but it is the ingredients in the rubber, red rubber especially. In the cases where the tissues have been strawberry red and the mucous membrane has been destroyed or been spongy and cushion-like all over the mouth, I have relieved mouths by not wearing the plate for two or three weeks or a month and making a black rubber plate. There is no doubt that the riding and rocking in the mouth has a greater tendency to disruption of the alveolar process than anything else. The gold lining I have tried, but have not found it satisfactory, owing to the gold being too thin. It is a mistake to put a plate in before the tissues have contracted. In no case does a patient get a plate from me in less than three or four months.

DR. W. E. WALKER, of Bay St. Louis, Miss., at this point asked Dr. Boyd if he noticed the conditions spoken of as frequently with black rubber as he did with red rubber.

DR. BOYD said: There were but few black plates used in his section of the country. I use the whalebone rubber, which is a brown rubber. My opinion is that dark rubber will not produce trouble if the occlusion, as well as the adaptation to the mucous membrane, is perfect. With black rubber I think there will be no inflammation.

Digitized by Google

DR. G. W. COOK, of Chicago, said in regard to dark rubber, the worst case he ever saw was in connection with a black rubber plate made by a gentleman in the city, who had tried three red plates and had had very poor satisfaction, and concluded he would make it work with black rubber. A few months after the insertion of the black rubber plate, he came to the conclusion that the patient could not wear rubber at all. He has used dark rubber almost exclusively, and was sorry to say that he had had many cases of rubber-poisoning from the dark rubber.

DR. MOORE asked if the speaker had an air-chamber in his plates?

DR. COOK. No, sir.

DR. MOORE. Have you ever had trouble in the lower jaw?

DR. COOK. Yes, a very severe case, where a gentleman had lost the two centrals and one lateral and some of the posterior teeth. His mouth got quite sore from the use of the plate, and it was not exactly where it impinged upon the next tooth either. Shortly after that he went East, and the rest of his teeth were taken out and a rubber plate inserted. When he came back, his mouth was quite sore. I took him to an eminent person in this city, who pronounced it a case of rubber-poisoning, and it was black rubber that did it.

DR. H. C. MILLER, of Portland, Oregon. In my opinion it is the material contained in the rubber that causes most of the trouble. In most all the cases I have seen, the plates were made of red or brown rubber, and in the worst cases the symptoms were of mercurial poisoning, more or less. Under no circumstance do I use a red rubber plate, but use black rubber, covering the surface with tin foil. We must admit that a plate which is a non-conductor, covering the surface of the mouth, is not equal to a metallic plate, which is a good conductor of heat. I replace a great many rubber plates with celluloid which is almost equal to gold in its results. Dentists are justified in making rubber plates without a metallic lining. It is only a question of time that the lining is worn through, and persons who are subject to mercurial poisoning will be more or less affected by it. A great

Digitized by Google

deal of the trouble is due to poor fitting. Mouths are made sore with black rubber and also gold plates, which is to be attributed in most cases to improper adaptation.

I think that air-chambers should be abandoned; while it might be of advantage in assisting the patient to hold the plate in position at first, by being careful and with a little persuasion it can be dispensed with.

DR. S. J. MACMILLAN, Somerset, Pa., said: The point made that the soreness is caused by poor-fitting plates is well taken. When we find soreness we must look for the cause in some place other than that a rubber plate has been worn, although the rubber, being a non-conductor, is probably a fruitful cause of this trouble, and the metallic plate is better suited to these mucous surfaces.

DR. COOK had a patient once who was unable to wear a metallic plate, and for whom he had to make a rubber plate finally. He had a gold plate put in in New York, but was unable to wear it. I made a rubber set for him which gave no trouble. What it was that caused the trouble I do not know, and I do not know that the other gentleman did. Has any one here had such an experience?

DR. H. C. MILLER, Portland, Ore. I believe we overlook the fact that the tissues of the mouth covered by the plate are liable to the same trouble as other portions of the body. We may have canker on the gums or other parts of the mouth caused by other means than by plates. A gentleman came to me only a few weeks ago who had not worn a plate for years, and within the last year had had a sore mouth a great deal of the time. There appeared to be cancerous patches in a great many places. The trouble is not always caused by the plate.

DR. W. E. WALKER said that he had seen a few cases of rubber-disease, and that it should not be confounded with mucous patches that come when the plate extends too far. What is known as rubber-disease is throughout the surface covered by the plate, with a distinct outline where the plate stops. He was inclined to think that due to rubber being a non-conductor rather than because it contains mercury.

Digitized by Google

DR. G. B. HUFF, Somerset, Pa., thought that troubles often called rubber-disease are not rubber-disease. It may be caused by misfitting plates or deep air-chambers. He thought that the non-conducting property of rubber was the principal cause of the trouble. He had noticed what is called rubber disease under gold and other kinds of plates.

DR. I. P. WILSON, Burlington, Ia., said that if the plate was left out of the mouth at night the trouble would be greatly avoided. Dentists generally advised their patients to keep the plate in all the time. If any part of the body were covered all the time, an abnormal condition would probably be produced. If the plate is taken out at night and cleaned thoroughly, the mouth will remain in a healthy condition in forty-nine cases out of fifty. The spongy condition of the mouth is noticed most frequently in the front part, and usually occurs where the molar teeth of the lower jaw are out, which throws the pressure on the front teeth.

DR. E. S. CHISHOLM, Tuscaloosa, Ala., did not think rubber should be banished from artificial dentures altogether. In most cases where patients have sores in the mouth, they may not clean them once in a week or a month. I had an experience where a gold plate had been worn and produced that redness and tumefied condition, and by substituting a rubber plate the patient was entirely relieved. In my case I never leave any rough surface. I scrape very delicately the surface of rubber plates with a small sharp instrument, and I do not have a troublesome case in five hundred.

DR. BOYD. In regard to cleanliness, while gold plates are easier kept clean they sometimes come to us very dirty. While cleanliness does enter into the cause of the trouble, if we make a plate perfectly adapted, with no air-chamber and the surface of the plate perfectly smooth, in the absence of some peculiar idiosyncrasy and susceptibility to the mercury in the rubber, none of the disease spoken of will occur.

DR. J. D. PATTERSON, Kansas City, the temporary chairman, closed the discussion, saying: It has been a surprise to hear so much on what is called rubber disease. I think

Digitized by Google

there is no such thing at all. It has been proved that the mercury in rubber is entirely inert. The first and prime cause is uncleanliness of the plate. A rubber plate perfectly polished inside and outside will be as good as a gold plate, except that the gold plate is a good conductor of heat; but if the rubber plate is taken out at night the irritation will be done away with to a large extent. I have had experience with gold, aluminum and all kinds of rubbers, and I do not believe there is any poisonous quality in the rubber that affects the mouth. The little ducts are destroyed by keeping the plate in the mouth continuously; more, perhaps, in rubber because it is more confining. Rubber disease has been unknown to me for fifteen or twenty years. It has been demonstrated that no deleterious effects can be produced by the presence of mercury in rubber.

Adjourned.

FOURTH SESSION.

On Thursday, August 17th, the Section was called to order at 2:30 P. M. by the chairman, Dr. G. V. Black.

The following paper was read:

PATHOLOGICAL CONDITIONS OF THE AIR-CAVITIES OF THE CRANIUM RESULTING FROM DENTAL LESION.

BY I. P. WILSON, D.D.S., BURLINGTON, IOWA.

Diseased conditions of the air-cavities of the cranium are of frequent occurrence, and very often of uncertain origin.

Nasal catarrh is usually the outward manifestation of these pathological conditions, the nose being the only outlet for the secretions from these cavities.

An exploration of the nasal fossæ will reveal the fact that more than a score of chambers or cells open into this convoluted passage.

It may be well, first, to examine briefly the anatomical relations of the parts under consideration that we may more

Digitized by Google

fully comprehend the cases here to be reported, and the reasoning to be offered.

Commencing our examination at the anterior nares we at once come in contact with a very thin convoluted plate, called the inferior turbinated bone.

Directly above this body is found a small straw-like opening that leads to a large air-cavity in the upper jaw. This is called the maxillary sinus or antrum of Highmore.

This cavity is very irregular in form, and extends from the thin orbital plate above to the alveolar process below and is separated from the nares by a very thin plate of bone. Its anterior termination is somewhat pointed just above the apex of the root of the first or the second bicuspid tooth.

Its posterior paries separates the cavity from the zygomatic region, while its facial aspect points deeply into the malar bone.

It is important in this examination to note the fact that thin laminæ of bone are frequently found rising from the floor of the antrum which partially divide that cavity into two or three compartments.

Occasionally one or more of the roots of the first or second molar perforate the floor of the sinus so that the apices of the roots are only covered with the soft tissues and the mucous membrane that lines the cavity. My observations lead me to believe that the buccal roots more frequently penetrate the floor of the antrum than the palatal roots.

The antrum is quite small at puberty, but rapidly develops after that time, until it will sometimes contain an ounce and a half of fluid. Usually, however, it is much smaller, varying greatly in different persons.

Returning to the nasal fossæ we next find the middle, and then the superior, turbinated bodies, which are convoluted projections from the ethmoid bone.

A study of the ethmoid is full of interest, both from a physiological and a pathological standpoint.

This wonderfully fragile structure is hedged in on all sides by numerous bones of the cranium and face, and can only be studied accurately when disarticulated.

Digitized by Google

Its measurement is about 1¾ inches in length, 1½ inches in depth and 1¼ inches in thickness, making it of a somewhat cubical form.

The bone is composod of a perforated horizontal plate that fills in the space or "notch" between the orbital plates of the frontal bone.

To the lateral borders of this perforated or cribriform plate, as it is called, are attached on either side a spongy mass of bone composed entirely of cells, some of which communicate with each other, while all open either directly or indirectly into the nasal fossæ.

Descending from the median line of the inferior surface of this horizontal plate is a smooth perpendicular plate of bone that passes down freely between the two "lateral masses," and thereby assists in forming a part of the septum of the nose.

On the superior surface of the cribriform plate, and continuous with the perpendicular plate, rises a firm triangular-shaped crest of bone resembling in form a cock's comb, from which it derives the name "crista galli." This cribriform plate forms a part of the cranial wall, and the olfactory lobes of the brain rest upon this sieve-like structure; and the nerve filaments sent out from the under side of these lobes pass through the numerous foramina of the plate, and are distributed in the mucous membrane of the septum, the roof of the nose, the superior and middle turbinated bodies, and upon the "lateral masses" of cells, furnishing a complete network of olfactory filaments, so that this marvelous structure of bone is found to contain the organ of smell.

Continuing onward and upward in our research, we find two other large air-cells situated between the outer and inner tables of the frontal bone. These sinuses also communicate freely with the nostrils.

Passing downward and backward we discover two more large air-cavities in the body of the sphenoid bone, and intimately associated with these are several open cells, which are closed by the articulation of the ethmoid at that point.

These cells, like the others of the cranium, are not fully developed until after puberty.

Digitized by Google

We have now examined the cavernous passage, and find that all these cavities communicate freely with the nostrils. We also find that one continuous stretch of mucous membrane covers all of these uneven surfaces.

A pathological condition of any one of these parts must necessarily endanger the health of other parts contiguous therewith. These diseased conditions are usually known by the ambiguous name of "nasal catarrh." The seat of the disease is too frequently overlooked, and so the treatment is directed to the *effect* and not the *cause* of the malady.

The object of this paper is to call attention to the fact that pathological conditions of any or all of the air-cavities of the cranium not unfrequently have their origin in dental lesion.

Remembering that the apices of the roots of the first and second superior molars are separated from the maxillary sinus only by thin plates of bone, and that in some instances these roots penetrate the floor of the antrum, with nothing but the soft tissues of the mucous lining covering them, we can readily understand how easily an outlet can be gained for putrescent matter and gases through the antral cavity, and into the nose.

When an abscess forms at the root of one of these molars pressure is brought to bear upon the tissues surrounding the apical portion of the root, and usually after days of great suffering the weakest point in the surrounding tissues gives way, an outlet is formed, and the poisonous matter is discharged either into the antrum or into the oral cavity. The acute form of the disease then subsides, the suffering is relieved, and a sluggish and more insidious form of the disease begins.

The pulp chamber and the canals of the tooth causing the difficulty contain the remains of the decomposed pulp, and the gases continually generating therefrom.

The only means of escape for the septic matter and effluvia is through the opening that nature has formed, and if this be into the antrum, the mucous membrane of that cav-

Digitized by Google

ity must very soon become diseased from the contaminating influence of the virulent matter and gases that will be continually thrown upon its delicate structure.

But its baneful influence may not stop here. After possessing and polluting the antrum it passes out through the ostium into the middle meatus of the nose, and the cavernous passage is bathed with the infectious discharge.

The erect position of the body during the day, the recumbent position at night, lying sometimes upon the back, at other times upon the right side, and then upon the left, carries the poisonous matter by gravitation to almost every surface above described.

But should any of the cell membranes escape actual contact of the virus, none of them can escape the effluvia that must take possession of every air cavity associated with the nasal fossæ.

The exclusion of pure air from these chambers, and the continual presence of noxious matter and gases will carry contagion from one compartment to another, until disease has fastened itself upon the susceptible tissues of the mucous membrane, and the whole cavernous passage has become involved.

But this paper need not be confined to theory. Cases in practice are too numerous to admit of a doubt as to the correctness of the grounds above taken.

A detailed report of a single case will be sufficient to illustrate the subject under consideration.

About two years ago, Mrs. C., the wife of a clergyman from a neighboring town, consulted me with regard to a diseased condition of her teeth. She complained of a dead, heavy pain in her cheek bone, and under the "bridge of the nose," also in the frontal region. Her eyes had a languid appearance, and were continually discharging a water-like substance. In addition to these distressing symptoms she was greatly afflicted with "nasal catarrh." Her breath was exceedingly offensive, her nervous system shattered, and she seemed to be a physical wreck. The catarrhal discharge from both anterior and posterior nares was loathsome to her.

Digitized by Google

self, as well as annoying to her immediate family and friends. Realizing this, she isolated herself as much as possible from her household. She partook of food sparingly and without relish. The sense of smell was greatly impaired, and the resonance of her voice was gone. Life had become a burden. In this depressed condition of body and mind she accompanied her attending physician to my office.

On examining her teeth I found the superior second bicuspid and the first molar on the right side had been filled many years before. Soon after they were filled, one or both of them had ached, followed by a swollen face. Since that time they had given her no trouble, and she supposed them to be in good condition. Both teeth were found to contain putrescent pulps, with no visible means of escape for the foul matter and gases that were continually forming. This suggested the probability of the outlet being into the antrum. The teeth were both extracted, and an opening found through the alveolus of the anterior buccal root of the molar into the maxillary sinus.

After enlarging this opening, about an ounce of warm water was injected into the cavity, and a large amount of corruption was forced through the ostium into the nose.

An exploration was then made and a thick cheesy substance (dehydrated pus) was found stored away in the recesses of the sinus. An hour was spent in removing this corruption, and in irrigating the cavity with water containing a few drops of carbolic acid.

The second day following, an antiseptic wash was again used in thoroughly drenching the parts. This treatment was continued from time to time for a month or six weeks when a normal condition of the antrum was re-established.

The distressing feeling in the ethmoid region, however, continued, though the catarrhal discharge was greatly diminished.

It would have been well at this time to have turned the case over to a rhinologist, but there being none in my own town, nor where the patient lived, I directed her to cleanse the nostrils thoroughly every day with a solution of chloride of sodium, and in due time report to me the result.

Digitized by Google

It is sufficient here to say that in less than a year the catarrhal trouble had entirely subsided, and the general health was completely restored.

The treatment of this case, it will be observed, was very simple. Medicinal agents were used sparingly.

Keeping the diseased parts thoroughly cleansed aided nature in her benign work of restoration.

In tracing the history of the case we have found that the difficulty originated in diseased teeth. Then followed the antral disease, and later on the air-cavities in the ethmoidal region yielded to the bad influence of associate parts, and finally the whole pator-narium became the seat of a loathsome disease.

Prior to this difficulty the lady had always enjoyed excellent health, so that no constitutional tendencies to disease stood in the way of a rapid and complete recovery.

Had she been of a scrofulous diathesis a more persistent course of treatment would have been required, with much greater uncertainty as to results. In other words, when a pathological condition of the air-cavities of the cranium is found to be due to diseased teeth, or any local cause, we may confidently expect to be successful in our treatment after removing the lesion.

But if the origin of the disease is of a constitutional character, local treatment will not be sufficient to effect a cure. Eternal vigilance in cleansing the parts may palliate and hold in check the disease, but back of all lies the predisposing cause, which can only be met through systemic treatment.

When local or constitutional disease has its origin in dental lesion, it behooves the dental practitioner to be wide awake to his duty, in being able not only to detect and remove the cause, but to intelligently and successfully treat the case; but remembering always that if the effect of dental lesion and antral disease still lingers in the upper air-cavities, and will not yield to personal cleansing of the parts, the future and final treatment of the case properly belongs to the rhinologist.

A large majority of the cases I have been called upon to

Digitized by Google

treat have been entirely cured, and although the catarrhal condition of the cells associated with the posterior nares has been last to yield to treatment, yet hygienic living and scrupulous care in cleansing the parts has usually been sufficient without further treatment.

In cases of a strumous character, the tendency to caries of the spongy bones is greatly increased.

I have, however, met with two or three cases of long standing where necrosis of the fragile structure immediately surrounding the ostium of the antrum, and of parts of the ethmoidal tissue had taken place, and yet these persons had previously enjoyed robust health.

Tracing the history of these cases carefully, I have found that nature's first signal of danger was an aching tooth, followed by inflammation and swelling of the face. The acute form of the disease had subsided in a few days, and a catarrhal discharge from the nose followed. The pulp of the aching tooth was now dead and putrid, and the poisonous matter and gases generated therefrom were discharged into the antrum. But little more than an uneasy sensation in the region of the sinus was experienced for a time, but the symptoms of nasal catarrh continually increased. Months and years passed—the disease became chronic, not only in the antrum, but in the ethmoidal cells.

The muco-purulent discharge into the middle meatus of the nose, and upon the mucous membrane of its associate parts, though resisted by vigor and health of body for a time, finally yielded to the septic poison to which the parts were continually and unrelentingly exposed. The soft tissue surrounding the projecting processes had broken down, and necrosis was the result.

The thin plates of bone so often found rising from the floor of the antrum—the fragile frame-work which supports the soft tissues around the ostium, and the paper-like structure of the ethmoid, are first to be divested of their mucous membrane, and their life-supporting periosteum. This is necessarily so from the very nature of their anatomical formation, and because of both sides of these thin processes

Digitized by Google

being so long and continually exposed to the contaminating influence of their environments. The solution of the foreign substance then takes place, and is usually carried away with the catarrhal discharge.

The evidence of this loss of osseous tissue is found in the fact that the ostium is greatly enlarged, the sense of smell has been destroyed, and the voice has lost its former resonance. The fact may also be established by ocular demonstration.

I have found a change of medicinal agents beneficial in the treatment of these cases. Oil of cassia and oil of eucalyptus, properly diluted, are valuable remedies. Other antiseptic lotions have their value. These cases may be effectually cured with a vigorous, untainted constitution to aid us in our efforts.

When the soft tissues that cover the frail processes above referred to are broken down, the ragged edges of bone thus exposed are a source of irritation to the mucous membrane all along the line of demarcation between the dead tissues that have been thrown off, and the living tissues that remain, so that morbid growths in the antrum and in the nose frequently have their origin from this provoking cause. Nasal polypus usually commences in or near the outlet from the antrum. This is a significant fact.

The soft tissues surrounding this straw-like opening are most exposed to the deadly virus that passes from a diseased antrum into the nose. Broken-down tissue, and morbid growths usually commence at this point, the polypus sometimes developing into the antrum, and sometimes into the nose.

A mistaken diagnosis is too often made here. The mechanical obstruction thus produced is by no means the *cause*, but the *result* of the antral disease, and back of all may usually be found dental lesion.

Medical writers upon pathological conditions of the ethmoid cells, and the other air-cavities of the cranium, including the antrum of Highmore, rarely ever mention the teeth as even a possible cause of disease in these cavities, or as in any way affecting the general health.

Digitized by Google

Diseases of the human teeth, and the dire consequences that so often follow, not only in the direction to which attention has here been called, but in other directions where equally grave results so often manifest themselves, involving the health and happiness of thousands of human beings, should be a matter of the greatest concern to both the medical and the dental professions. Suffering humanity demands of us our best thought, and our best skill, in the noble work to which we are giving our lives.

DISCUSSION.

DR. FRANK ABBOTT, New York. I have had more or less experience with such diseases, and have met with much the same experience as the essayist. I have arrived at several conclusions; first, that medical men, as a rule, do not take into account the conditions that present themselves on account of diseases of the teeth. They would, for instance, treat for years a case of antral abscess for nasal catarrh, and the patient might die on their hands and they may never ascertain the cause of the trouble. It is catarrh apparently of the most violent form, passing from one air-cavity to another.

The second conclusion is that in all cases of disease of the antrum it is almost, and, in some instances, entirely sufficient to remove the cause of the trouble and then keep the parts clean. Unless cleanliness is followed out it makes no difference what is used in the way of antiseptics the case will not recover. Cleanliness is the best antiseptic treatment that can be employed. This may be accomplished with warm water alone, or with a little salt added. Many people are reckless in treating these cases, forgetting that the cavities are lined with extremely sensitive mucous membrane. If anything is thrown into the antrum that is below the temperature of the body, more or less depression of the mucous membrane is produced by the shock. If you use a strong antiseptic you produce more trouble than you had to start with. I have seen cases where carbolic acid had been used so strong that the bone under the orbit was denuded

Digitized by Google

of mucous membrane for a space as large as the thumb nail, where the material had struck when thrown with a syringe. Carbolic acid may be used by properly reducing; plain water will cleanse if you throw enough in the proper direction. A syringe-point should be used that has fifteen or twenty perforations in every direction. By throwing in the material slowly, it will wash out the cavity everywhere.

DR. INGERSOLL, of Keokuk, Iowa. The subject illustrates one fact, and that is the influence of small causes in producing serious results.

I do not think medical men or dentists have sufficiently considered the importance of the smallest causes when long continued. Prolong any irritation, and it becomes a very serious irritation. Let a drop of water fall on a man's head, and no harm is done; but let it continue for days, and the drops of water will drive the man insane.

Let a mote be thrown into the eye. At first it is scarcely perceptible, but it may produce the most serious results. A little pulp is left in a canal. It may go for years without giving trouble, but subsequently the trouble comes.

DR. BLACK, having called Dr. L. L. Davis to the chair, said:

I wish to speak of a case which perhaps should go on record in this connection. A gentleman went to my son for entrance into the Sanitarium at Jacksonville. I saw him, and found he was affected with some obscure disease. He was unable to turn himself in bed, and in connection with this there was a mild form of insanity. He was a bachelor of about fifty-five years of age. After a few days' study of the case my son made out a case of Addison's disease, and yet there were some puzzling symptoms. The condition of the nostrils was looked to, and it was found there had been some disease there. During the time he was there he had symptoms that did not seem to belong to Addison's disease. Finally he died with cerebral symptoms. A post-mortem was held, and Addison's disease was found. I suggested that the skull be opened. It was done, and we found under the anterior part of the brain, over a consid-

Digitized by Google

erable portion, a large pus-pocket that had evidently been the product of nasal catarrh and the immediate cause of death.

DR. CHISHOLM, Tuscaloosa, Ala., mentioned a case which came to him a few months ago, where the patient was suffering violently from acute pain about the eustachian tube, although it was not indicated by any external marks. His physician treated for catarrh in every way that is ordinarily known to physicians, but without success. He was sent to Dr. Bosworth, of New York, who took the case in hand, but no relief was afforded. A few days before I left, his physician called me in for consultation, and asked me if it could be related to any condition of the teeth. On examination, I found the slightest soreness of the left superior first molar, and the first bicuspid. I extracted the first bicuspid, and three days later the pain had subsided somewhat. On the third day I extracted the other, but still he continued to linger in this suffering condition. I recommended the perforation of the antral cavity, but the physician objected to it. It is a very peculiar case. Since I left home I have been written that they had excised a portion of the nerve; that they had opened into the antral cavity and that it was diseased somewhat. At the apex of one of the roots there was a very small enlargement. I believe it would have been well to extract every tooth, if necessary, to discover the location of the trouble.

DR. A. O. RAWLS, Lexington, Ky. I have noticed frequently the origin of this trouble in the antrum would come from the frontal sinuses. We are all the time fighting the disease from the antrum when it ought to be fought from the sinuses. He thought that Dr. Abbott was right in stating that we were over-treating with antiseptics. Anything that changes the structure of the mucous membrane would act as a poison to it.

There are times, however, when it requires something more than cleanliness. Water does not always clean; we often need to use something different to secure cleanliness, as we bring about a new condition and new development of

Digitized by Google

tissue. Dr. Williams perhaps gave the best definition of what catarrh is. He claims that the development of the epithelial cells is so rapid that they are wept off and leave a continuous raw and imperfect surface at all times and in all cases. We must have a change of the organization of the surface and water, or cleanliness will not always do that alone. We must have something that will bring about a new condition of the membrane.

DR. G. VARGAS PAREDES, Colombia, South America, said that he had a good deal of experience in the matter, and mentioned the case of a young man where the antrum extended so far forward as to reach the root of the cuspid. He cleansed and explored it, and washed out a great deal of pus which was found throughout the antrum. The root of one tooth protruded through the floor of the antrum. He used a solution of four per cent of boric acid in warm water to cleanse it, and then opened the cavity, which had been caused by the enlargement, in order to aid the exit of pus, which might be formed, by the force of the gravity, and continued this for three weeks, but did not find any change for the better, the patient complaining of much pain in the left upper cuspid, which tooth was badly decayed, and there was a great deal of pericementitis. After extracting the tooth a great deal of pus was discharged, and after washing and cleansing it perfectly he found that there was the seat of the trouble. He continued the same treatment in the front chamber of the antrum, using the same solution of boric acid, and it worked a radical cure of the case. He at the same time treated the patient constitutionally with a preparation of iron. The speaker believed that constitutional treatment is absolutely necessary, either in syphilitic, scrofulous, or other cases.

DR. I. P. WILSON, of Burlington, Iowa, closed by saying he did not think it necessary to say anything further, as no exceptions had been taken to his paper, but he was glad that Dr. Abbott emphasized the necessity of absolute cleanliness. He spoke of using warm water alone; I have not gone that far. I use medicinal agents sparingly in irrigating the

Digitized by Google

antrum, and I was glad he emphasized that one thought. I am satisfied that over-treatment is a prevailing evil in the treatment of the antrum in many of our dental troubles.

The subject was then passed, and the first subject assigned for discussion was taken up: "Can Apical Pericementitis occur in connection with Roots which have been perfectly sterilized and filled; and, if so, under what circumstances?"

DR. A. O. RAWLS, Lexington, Ky., opened the discussion, and said that to sterilize a tooth perfectly it was necessary to go beyond the ordinary root-canal clear through the cementum. The speaker did not believe that there was any anastomosis between the tubuli of the dentine and the stellate structure of the cementum. If you can fill the canal up to the extremity, then in all probability you have done all that is possible to do to prevent pericementitis. But is it possible to do this? Unless it is done, disintegration will come some time or other unless the subject is very tolerant of these irritations. It should be completely desiccated and dried by means of a hot-air syringe, drying all the tubuli, and then suddenly while desiccated apply some ethereal solution, as varnish, or something of that kind, and let it fly like a flash into these canals. It is the first shot that settles it. You want to get to the point next to the cementum first, and if you fail in that you have made a failure in protecting the dentine absolutely; then when you have put the substance into the canal you still have the question to contend with as to whether there is any substance there that is not compatible with health.

DR. I. P. WILSON, of Burlington, Iowa, said that there was one other cause of pericementitis after the root had been thoroughly sterilized and filled. When we examine the histological structure of a tooth, we find a very small portion of the apex that is all composed of cementum; that small portion has without any doubt a direct communication with the pulp. The question need not come up whether there is a connection between the cementum and the dentine. If

Digitized by Google

you will cut a tooth in two longitudinally you will find two or three lines at the end of the root that is all cementum: none of it dentine; that portion of the cementum connects directly with the pulp. Now, if we apply arsenic to the pulp of the tooth more than once we are in great danger of devitalizing the pulp, not only throughout the main body but down to the very apex of the root. We have then destroyed that part of the pulp that is in direct communication with the cementum, and thereby destroyed the vitality of the cementum at that point. It then becomes a foreign body. I always feel afraid when that is done that I have destroyed the life of this apical portion of the cementum, and that no matter how thoroughly the canal is sterilized and the tubuli and the canal filled, that there is still a little foreign substance at the end of the root, and it is in those cases I believe that we have so often an uneasy sensation at the end of the root of the tooth. A long period may elapse without any real pain, but there will probably be some subsequent trouble.

DR. E. M. S. FERNANDEZ, of Chicago, thought the time would come when the use of poisons for devitalizing the pulps of the teeth would be abandoned, although he had not reached that point himself. Arsenic, he said, was a strong and unreliable poison, and very treacherous. Some say they do not use arsenic, but use cobalt, but it is the same or more dangerous in its metallic condition than arsenic. If we use it only once, we have no means of controlling it. I think some mechanical means should be adopted for devitalizing the pulp. We give nitrous oxide gas, ether, and chloroform for the extraction of teeth, why not adopt that for destroying pulps? Having gotten everything ready and having administered the gas, run a drill right through the pulp to the beginning of the root-canal. We know of cases where orange-wood has been driven right through, and they are very successful. I have seen them filled by quacks and seen them decay, but still there was no pericementitis of any kind. It was simply due to the way of destroying the pulp. They used no poisons, but used the essential oils a great deal. I think the main cause of pericementitis is the poison

Digitized by Google

used in destroying the pulp. You have the circulation destroyed when the poison is active,—the capillary circulation is destroyed. The obstructed functions of those parts is, to him, where the trouble lies. In devitalizing a tooth he tried to devitalize the pulp itself only. After devitalization the pulp is desiccated by use of tannic acid solution in glycerol; if that did not desiccate it thoroughly and he found a part of the pulp left he digested it with a solution of pepsin, and by all means avoids the use of poisons any further than the bulb of the pulp. Before applying the poison he lacerated the pulp, then used a strong saturated solution of tannic acid in glycerol and closed it with oxyphosphate of zinc and allowed it to go eight or ten days, then bored a small opening to see if it was dry enough; and if so, drew it out, the three little white threads at the apex of the root sometimes coming out with it. He had been very successful with that kind of work.

Adjourned.

FIFTH SESSION.

The Section was called to order on Friday, August 18th, at 2:30 p. m., by the Chairman, Dr. G. V. Black.

The following paper was then read:

PALATAL DISEASES AS APPLIED TO DENTISTRY. PATHOLOGY AND CASES.

By Vida A. Latham, D.D.S., F.R.M.S., Chicago, Ill.

Diseases of the palate are not so rare as is often thought by physicians and dental surgeons, if attention be paid to that part of the mouth.

Unfortunately we seldom or never find them spoken of in direct relation to the palate, but in a diffuse manner here and there throughout our text books under various headings. In our dental schools attention is usually only drawn to the upper part of the mouth in connection with cleft palate cases.

Digitized by Google

The anatomical position of the palate, by its structural continuity with the alveoli and gums in front, and its connection posteriorly with the tongue and pharynx by means of the pillars of the fauces, is liable to implication by the extension of disease from these parts; whilst, on the other hand, morbid processes originating in the palate may spread to the neighboring portions of the mouth, fauces or pharynx.

The physician sees many cases of tonsillitis but seldom or never considers them further than the present needs of the case requires, and yet we must remember how the palato-glossal fold is evidenced in relation to the tonsil, and appears as if spread out over the gland. The condition of this palato-glossal fold should always be studied in tonsillitis, more particularly in peri-adenitic changes.

The result of inflammatory changes in the tonsillar tissue has not received its proper share of attention.

Inflammation of the buccal tissue is not commonly found extending on to the mucous membrane covering the anterior edge of the coronoid process (the præcoronoid space of Allen), as it appears when the lower jaw is depressed; while inflammatory action about the inferior third molar, as all dental surgeons know, is readily transmitted to it, thence involving the soft palate. Conversely, ulcerations of the soft palate may tend to involve the tissues around the inferior third molar.

Another fold of great importance is the palato-pharyngeal. This determines the site of pharyngeal irritation, for immediately to the median side a corrugation of the pharyngeal mucous membrane is usually met with in pharyngitis, more particularly in syphilitic angina. In the seat of ulcerations the study of these folds is also of primary importance. Dr. Harrison Allen* has demonstrated by cases that ulcerations of the soft palate have their shape and position assigned by the arrangement of the blood vessels.

It is necessary to remember that the palate with the posterior pillars of the fauces, constitutes a septum between the nasal and buccal passages, which by contraction of the

* Proceedings Am. Med. Ass'n, 1872.

Digitized by Google

palato-pharyngei muscles becomes complete in the act of deglutition and thus cuts off communication between the two cavities. Therefore its structural and functional integrity is essential for perfect articulation, suction and deglutition.

The chief symptoms caused by lesions of this part are usually dependent upon impairment of these physiological acts. For convenience then I will try to briefly indicate a few of the most common forms of disease in this region and give details, with specimens, of some interesting cases which have come under my notice.

The diseases of the palate may be grouped into—

I. Congenital malformations, as cleft palate, which it is better to treat by itself as a subdivision of palatal disease.

II. Inflammation.

III. Ulcers.

IV. Necrosis.

V. Tumors.

II. INFLAMMATION may be either a simple phlegmon of the soft parts, or, in the case of the soft palate, may involve the periosteum and bone.

(a) *Phlegmonous Inflammation* is rare except as a result of extension from the tonsils and other adjacent parts. In the velum palati we find with it considerable swelling; but this sign is absent in the hard palate, owing to the intimate adherence of the mucous membrane to the bone. It may end in abscess.

(b) *Syphilitic Angina.* This coincides in time with early cutaneous manifestations, and is usually most marked in the palate. A diffuse redness appears with more or less swelling of the mucous membrane of the fauces, and is often of so mild a degree that it may pass unnoticed by the patient; but sometimes it assumes a parenchymatous form and may lead to abscess formation or even to sloughing of the soft parts. It may also become chronic, lasting two or three months.

(c) *Osteo-Periostitis.* This may originate from traumatic causes, extension of alveolar inflammation, or from syphilitic or tubercular cachexia.

Digitized by Google

The indications are local swelling, at first hard, then fluctuating. There is more or less pain (slight in the syphilitic form) in mastication and deglutition. Should abscess supervene, the bone usually is lost, and its bared surface may be felt through the opening of discharge. The separation of the sequestrum may leave a temporary or a perma-

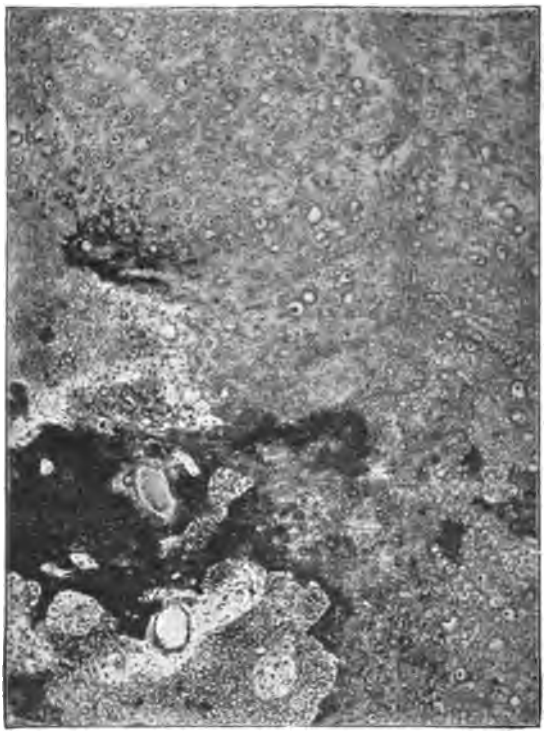


FIG. 1. ENCHONDROMA. OSSIFYING. PALATE.

nent fistulous communication between the mouth and nose. *A swelling or undue prominence on the roof of the mouth* may be due to various conditions, viz.: *Simple inflammatory affections*, e. g., a simple abscess forming in the soft tissue covering the hard palate, as, for example, an alveolar abscess, forming a connection with the superior teeth and burrowing backwards beneath the bone and periosteum, or in the soft

Digitized by Google

tissue forming the roof of the mouth. This condition may be distinguished from a periosteal sarcoma springing from the hard palate, which in some cases it closely resembles, by a history of pain, with symptoms of inflammation attending its formation, also by the presence in many cases of a carious tooth, the more rapid formation of the swelling, by its more elastic nature and the presence of fluctuation. (Fig. 1.)

In many cases when of a chronic nature and unattended by symptoms of inflammation recourse to exploratory puncture may be necessary to make up a diagnosis.

2. Gummy tumors.

3. Tumors or new growths, *e.g.*, a tumor originating in or involving the antrum, growing downwards and pushing before it the hard palate.

An epulis springing from the alveolus, growing backwards and involving the roof of the mouth.

I would here point out the objection to the term "malignant epulis" being applied to epithelioma, especially when they attack the gum. They are histologically so entirely different that confusion is likely to arise through it.

Epithelioma springing from the mucous membrane of the mouth or alveolus and sarcomata springing from the periosteum of the hard palate, and appearing as a soft, semi-elastic, more or less rapidly growing tumor affecting the roof of the mouth must be carefully diagnosed from alveolar abscess.

Displacements, an undue prominence or pushing forward of the soft palate, may be due to various causes, *e. g.*:

Naso-Pharyngeal Polypus.

Retro-Pharyngeal Polypus.

Pharyngeal Tumors.

Abscess of the soft palate.

Gummy tumors of the soft palate and very rarely meningoceles of the base of the skull or spina bifida, presenting itself on the anterior aspect of the vertebral column in the cervical portion.

III. ULCERS.

Digitized by Google

The main forms of ulceration of the palate are syphilitic, tubercular and epitheliomatous.

Syphilitic ulcers may be superficial or deep, as in the rest of the bucco-pharyngeal tract. (See former paper on Stomatitis, *Dental Register*, vol. 45, p. 605, Dec. 1891.) The former is common in the early secondary stage of the disease, the latter belongs to the third period, and results from the breaking down of a gummatous infiltration.

The deep ulcer appears late, from five to eight years after the first lesion, and is generally single. If situated upon the hard palate it is nearly always central, and involves the bone. If the soft palate be the point of attack, great destruction and deformity may result. Sometimes complicated adhesions form between the velum and the posterior wall of the pharynx, causing more or less stenosis of the pharynx and consequently interference with deglutition, often producing a nasal intonation of voice. In rare instances the tertiary ulcer may spread to the base of the cranium. The sore has the usual characteristics.

Epitheliomatous ulcers are found commencing in the velum palati, or pillars of the fauces, spreading from the tonsil, gum or tongue, and involving the palate secondarily from simple extension. These ulcers are extremely rare at primary lesions of the palate.

Tubercular ulcers. These are most frequently developed in childhood. They usually reach the palate by extension from the posterior pillars of the fauces, and are associated with tubercular disease elsewhere. The lesion usually makes its first appearance in the form of small tubercles, which project slightly above the surface. They break down into a number of erosions which soon fuse into an irregular ulcer of little depth characterized by festooned borders, and a yellowish base covered with pale granulations. The sore thus formed tends to travel slowly in a serpiginous course, but seldom tends to serious destruction.

V. TUMORS.

In addition to inflammatory tubercles, and gummatous swellings, the palate is subject to a considerable number of

Digitized by Google

true tumor growths, which may be briefly enumerated as follows:

Cysts, mucous and dermoid; fibroma; enchondroma and osteoma; myxoma; lipoma and adenoma.

The glandular tumor is by far the most common of the palatal neoplasms. It is often found upon the hard palate, generally implicating its lower wall on one or the other side, and may become as large as an egg or even attain a considerable size. It is soft, elastic to the touch and insensitive. It causes no unpleasant symptoms beyond the inconvenience attached to its encroachment upon the buccal cavity. Structurally it follows the type of a salivary gland, is invested by a capsule, and is united to the surrounding parts by a somewhat loose connective tissue.

The glandular elements of the soft palate may undergo hyperplastic changes, by which the thickness of the velum becomes greatly augmented, a condition which is probably analagous to the enlargement of the lip in strumous children.

Erectile tumors are almost confined to the hard palate, but the velum may be implicated by a nævus extending from the inner surface to the cheek.

Papillomata, in the form of small, pedunculated growths, are not very infrequent, and are most commonly attached to the posterior border of the soft palate and to the uvula.

Sarcoma is said to be rare, and is usually of the round celled variety, but in a few cases the fusiform and myeloid cells have been found.

Case I. A girl aged 8 years, on examination, showed a tumor of the palate, which was not apparently the cause of pain or difficulty in swallowing. On examining the growth more closely it was found to be about the size of a large walnut, extending from the soft palate on the right side, and projecting downwards towards the base of the tongue. It was unconnected with the bone and had a broad attachment. The microscopical slides showed small round and spindle shaped cells in great numbers, without any definite stroma and was a Lympho-Sarcoma. (Fig. 2.)

Case II. A lady aged 66 consulted a dentist with reference

Digitized by Google

to the fit of her plate, and on examining the mouth a nodule was found occupying the right half of the soft palate and growing forward over the hard palate, inward and across the middle line, and downwards so as to touch the tongue. It was globular, soft and elastic, almost fluctuating; the mucous membrane over it was thin and tense, not adhesive, and there were no enlarged glands.

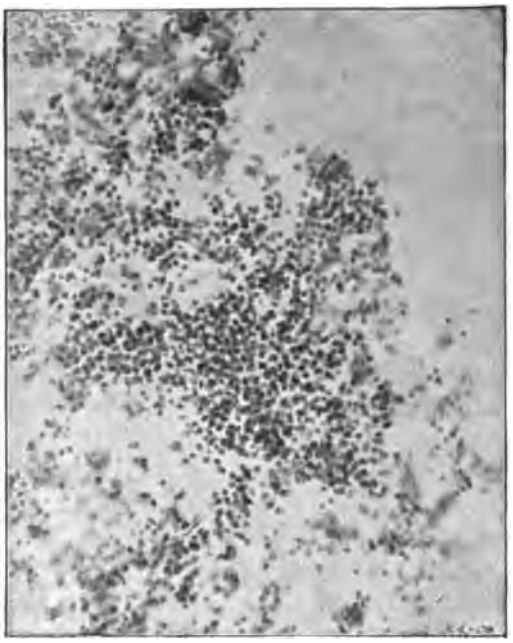


FIG 2. LYMPHO-SARCOMA.

The growth had been developing two years, lately with more rapidity. The voice was thick and indistinct, but swallowing was easy and painless. At the operation the mucous membrane was incised and some of it stripped off, then the growth easily shelled out. It was not firmly attached, but laid loosely in the palate in a distinct capsule. Hemorrhage was free, though easily controlled by pressure. On microscopical examination I found the specimen to be a mixed, round and spindle celled sarcoma with much em-

Digitized by Google

bryonic connective tissue and some imperfectly formed tubular glands.

Whilst speaking of palatal growths it may be as well to mention that many of them are by no means regular, some having a peculiar structure, and are altogether irregular and embryonic in nature. The tumors of the palate are like the tumors of the parotid region, and even like the submaxillary, which are manifestly embryonic in character.

Case III. Was a tumor from the hard palate of a woman aged 45. This was fourteen years in duration. It was small, circumscribed and freely movable; the mucous membrane over it being smooth and natural. The tumor was easily shelled out. In structure it had a fibrous ground substance, broken up by masses of cells into curious tracts and processes with sinuous, crescentic and indented edges, sometimes split and frayed. The cell masses were heterogeneous; many large squamous epithelial cells, also cell nests. In and around the tracts of fibrous matrix were scattered, shrunken, ill-shaped cells, which suggested that this matrix and the cell nests may have been due to degeneration or perversion of masses of cells. In other parts of the section the cells were of glandular type and laid down in tubules. The general aspect of this tumor under the microscope proved it to be altogether irregular and embryonic. I believe Mr. Shattuck, of London, has found these same cell nests in a case of tumor of the palate.

Case IV. This case is of much interest on account of its rare character, for so far I can only find mention of two other cases observed in this locality. The patient, a woman aged 53, blonde, excellent health, has been frequently to the dentist on account of loss of the teeth in the upper jaw, the reason for losing them being indefinite. A partial plate was made, but it never fitted well and had always been such a source of annoyance by causing irritation of the hard palate near the alveolus to the right of the median line, that she removed the plate constantly. About six months before she consulted another dentist, a small, soft swelling appeared upon the irritated part of the hard palate, behind the

Digitized by Google

alveoli of the incisor teeth, smooth and painless. As the pain increased she came to have the remaining tooth out on the right side and for two months the plate could not be worn on account of the growth. The pain now having increased in severity an operation was urged, to which she finally consented. The extent of the tumor was almost to

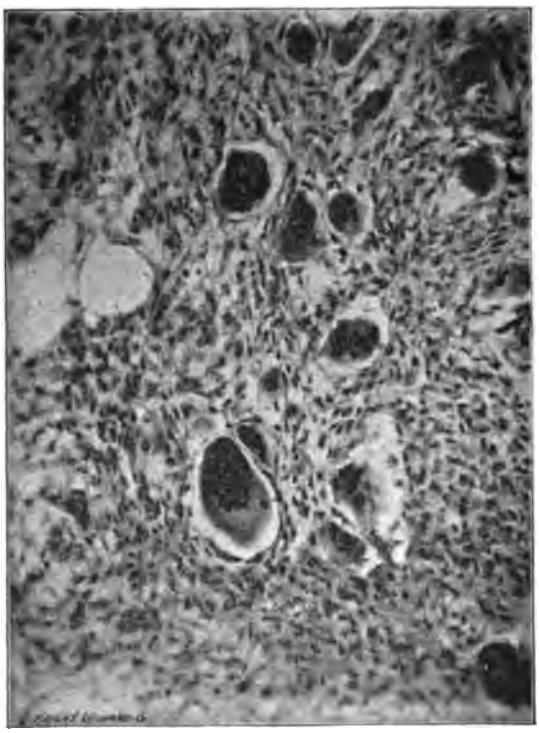


FIG. 3. MELANOTIC AND MYELOID OR GIANT-CELLED SARCOMA.

the alveolus on the anterior and external sides and to the middle line on the inner side; posteriorly to the suture between the maxilla and the palate bone.

The growth was flat, sharply defined, a raised surface and a rounded outline. It was uniformly firm, but not hard, of a purplish black color and occurring in patches. There were no enlarged glands.

Digitized by Google

The operation consisted in removing the whole right side of the hard palate, including the alveolus. To give room, the upper lip was freely detached from the bone.

The growth was quite firm and black on section, almost like blood. The bone was invaded with the growth, and in the central part was absorbed to the extent of a 5-cent piece.

The patient made a good and rapid recovery. The face suffered no deformity. An obturator was adjusted to the palate and the patient articulated quite clearly.

On making micro-sections, staining with logwood, methyl blue, etc., the tumor proved to be a spindle-celled sarcoma, originating from the periosteum, as the examination clearly showed. The cells were large, with a considerable amount of inter-cellular tissue. (Fig. 3.) Some myeloid cells; mass unevenly pigmented. Pigment appeared in irregular blotches, brown in color, and deposits made up of granules of ruddy brown and others black in color. The cause was no doubt well localized and of long continued irritation.

It is well to note that pigment is not usually found in the human palate, but is common in many of the lower animals. The literature on this subject of melanotic sarcoma of the palate is not easy to find, the best being Gussenbauer, *Prager Med. Wochenschrift*, Nov. 9, 1886; the most elaborate being, I believe, Gayrand in Dictionnaire Encyclopedique, 1884, but no mention of melanosis is to be found in it. Diction. Encycloped. des Sciences Mèdicales, article, "Palais."

Case V. Adenoma of the palate. (Fig. 4.)

References to this subject will be found in most of our systematic works on surgery, but they describe the tumors as being distinctly encapsulated, soft structures, and easily shelled out.

The patient, aged 50, had known of the growth for eighteen months. It passed back on the soft palate on the left side, ulcerating in the middle, and painless. The ulcer was a distinct feature in the case, and it was referred to a number of surgeons who agreed on its being an exceptional case. A cheesy, fetid mass, such as is often obtained from tonsillar follicles, was removed from the bottom of the ulcer.

Digitized by Google

In the operation the whole thickness of the soft palate had to be removed. Recovery was good.

On micro-section it showed adenoma. The fibrous tissue well seen, and seeming to form an ill-marked capsule around the periphery of the tumor. (Fig. 5.)

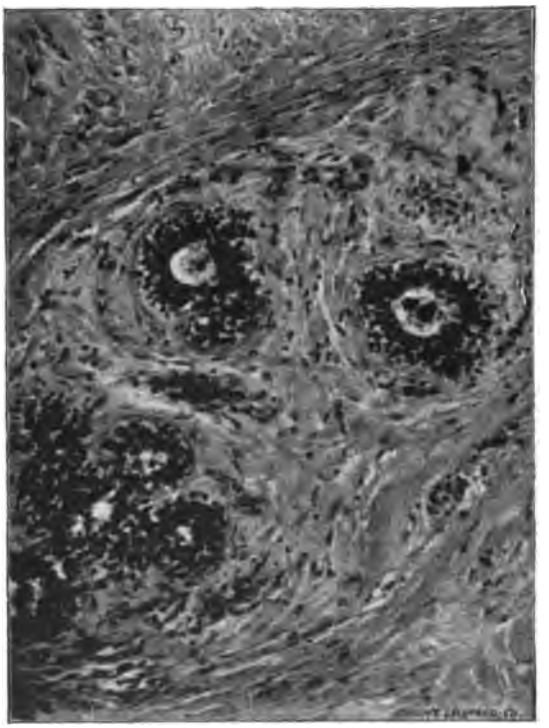


FIG. 4. PURE ADENOMA OF THE PALATE.

Case VI. Patient a laborer, aged 65; excellent health. Had a growth of one and a half inches in circumference, covered by healthy, non-adherent mucous membrane on the left side of the soft palate. He had noticed the growth for eight months. For three months it began to increase slowly, then burst through the mucous membrane in front of the palate. The last two months it grew rapidly.

The extent was by the hard palate in front, by alveolus

Digitized by Google

to the left, the middle line of the soft palate to the right. Tonsils and hard palate normal. No glands enlarged nor epistaxis. Some thirty years ago patient had a similar growth on same part of soft palate.

The operation was very extensive, and was performed by

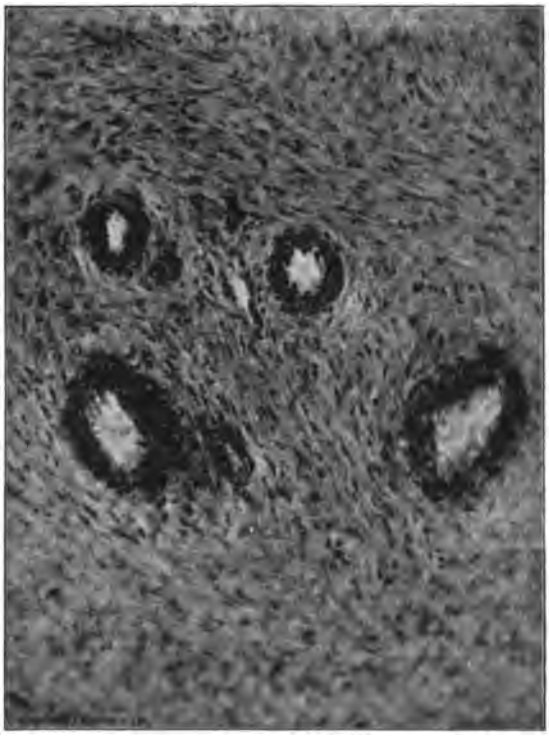


FIG. 5. FIBRO-ADENOMA OF THE PALATE.

Dr. J. M. Brennan, to whom I am indebted for the specimen. The left common carotid was ligated and the growth with the whole of the affected side of the soft palate removed, partly by knife and partly by thermocautery.

The tumor was encapsulated about the size of a large walnut, pinkish gray in color, and was diagnosed as alveolar sarcoma. Recovery was good.

On section large connective tissue cells were everywhere

Digitized by Google

arranged in larger or smaller groups by closely intersecting bands of well-formed fibrous tissue. The individual cells separated by delicate fibrils with larger trabeculæ.

Primary tumors of the soft palate seem very rare. From isolated reports it would appear that all forms of connective

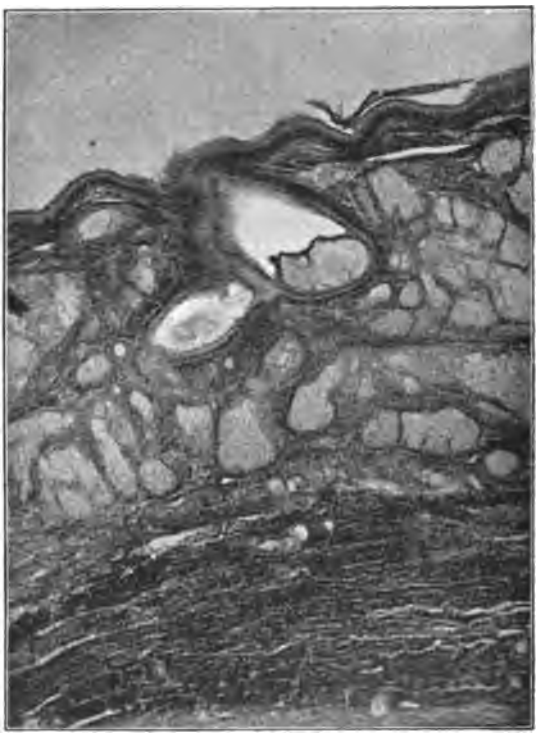


FIG. 6. DERMOID CYST.

tissue growths have been met within this region. It has been the seat of adenoid cancer, fleshy growths vaguely called Myoma, Dermoid and Papillomatous tumors. So far I have only been able to find four accounts of primary tumors of the soft palate, a cancer, a papilloma, a dermoid (Fig. 6) and an adenoma.

Case VII. Myxo Sarcoma. This is another form of the sarcoma groups, and seems the variety most frequent in this region.

Digitized by Google

The patient was a woman aged thirty, who had noticed the swelling five years ago. It increased gradually to within five months of the operation for its removal, then began to grow rapidly and with severe pain.

It appeared as a distinctly circumscribed, smooth, slightly

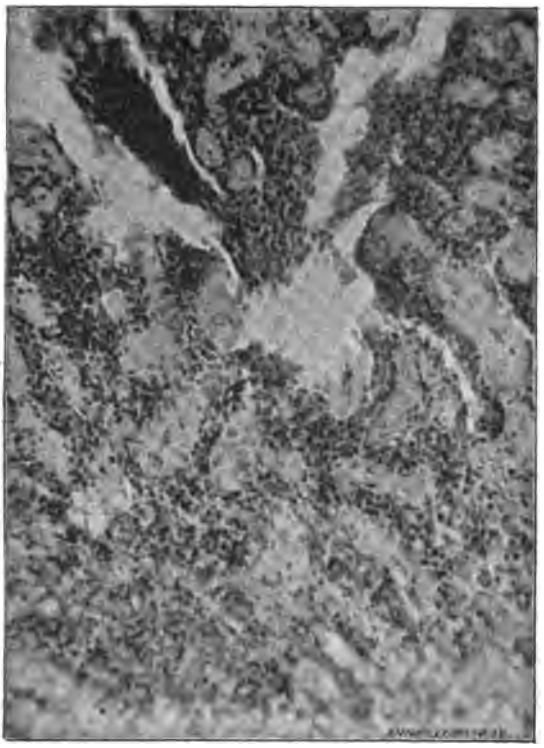


FIG. 7. MYXO-SARCOMA OF THE PALATE.

undulating, firm and immovable growth, the size of a hen's egg, on the left side of the hard palate, and involving some of the anterior portion of the soft palate. There was distinct egg-shell crackling at circumference, but none over its central part. The mucous membrane over it was healthy; no gland enlargement. The tumor appears to spring from periosteum, and contains a large cyst. It was diagnosed spindle-

Digitized by Google

celled sarcoma, intermixed with mucous—and this was afterwards proved by microscopical examination. (Fig. 7.)

As regards the treatment, I will not take up the subject, as it is too long, but simply mention a few points worthy of attention. The chief danger in palatal operations is from hemorrhage—the ingress of blood into the trachea—especially when the patient is under ether or chloroform. Cocaine renders this danger much less, but gives another form of trouble by its uncertain action.

The difficulties in differential diagnoses are many, and it requires much study to know the nature of the growths and to classify them properly on account of their irregular morbid histology.

The micro-negatives were kindly made for me by Wm. H. Knap, M.D., of Chicago.

DISCUSSION.

DR. EMILY WATERMAN-WYETH, of Philadelphia, Pa., said that the subject was rather that of general surgery. She questioned whether cases (except those of recent origin) may not develop or return again, and asked whether these cases were generally successful.

DR. LATHAM stated in reply that these cases were simply brought before the Section because they differed from those generally described in text-books.

The following paper was read by the Secretary of the Section, Dr. E. S. Chisholm:

SOME FACTS—WITH MODELS—SHOWING THE RELATIONSHIP OF THE DENTAL INTER-ARTICULATION WITH MORE OR LESS OBSCURE PAINS ABOUT THE TEETH AND JAWS.

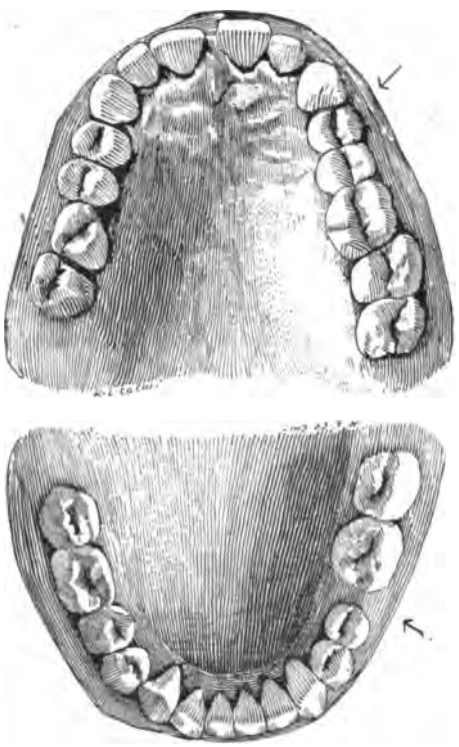
BY L. VAN ORDEN, M.D., SAN FRANCISCO, CAL.

I.

In April, 1889, Mr. W. G. L. presented himself with acute pericementitis of the left superior cuspid, which possessed dense structure, with a fair-sized gold filling upon its distal

Digitized by Google

aspect. At the time, a pulp lesion was not presumed to exist; but as it was observed that some irregularity was present, and that the occlusion was not normal, an engine stone was used to relieve the tooth of undue work and the patient of an amount of pain that almost seemed to demand resource to extraction. No abscess formed, and the recovery was so rapid as to fix the case in the writer's mind without the aid of any memorandum. An examination of the case after four years shows no recurrence of any trouble—but discoloration seems to point to death of the pulp. Refer to Models W. G. L., showing absence of the left inferior first molar.



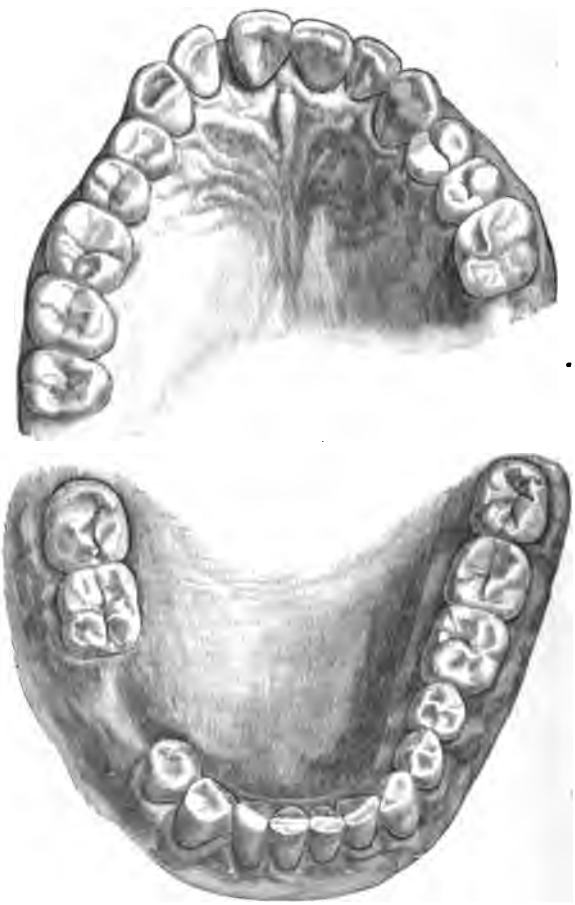
MODELS W. G. L.

II.

See Models C. B. On Christmas Day, 1891, Mr. C. B., aged about forty-five years, of bilio-nervous temperament, called upon the writer at his residence, with an acute abscess pointing upon the lingual aspect of the socket of the right inferior third molar, well below the gingival margin. Temporary relief was afforded by evacuation, and, at several subsequent sittings, type-writer's carbon paper was made use of and the occlusion of the tooth with the superior second and third molars rendered comfortable. By reference to the models marked C. B., and which are the ones

Digitized by Google

made use of by Dr. G. S. Dean in the illustration of his paper published in 1892 in the *Dental Cosmos*, as a reply to the paper by Dr. Davenport, of Paris, on the Dental Inter-articulation, it will be observed that the right lower first

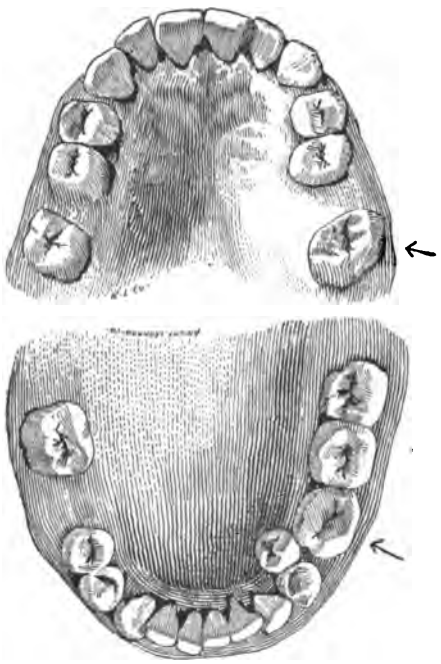


MODELS C. B.

molar and second bicuspid had suffered extraction some years previously. While Dr. Dean pointed out several ill effects that had seemed to follow these extractions, including noticeable cupping of the right cuspids and bicuspids

Digitized by Google

and pyorrhœa alveolaris of the right superior central and lateral incisors, involving a loss of their proximal process to the depth of about one-half inch, it seemed probable that the forward migration of the right inferior second and third molars had given rise to slight but repeated shocks or insults to the latter tooth. The *cup* and *saucer* form of the inter-articulation of the right third molars may here be adverted to. The distal edge of the saucer has seemed, in a number of cases, to be especially concerned in producing the slight shocks which resulted in such severe inflammation. Though this abscess was the third one that had formed, no other trouble was complained of by the patient until some eighteen months later, when an abscess having formed on the buccal aspect, the tooth was extracted.



MODELS D.

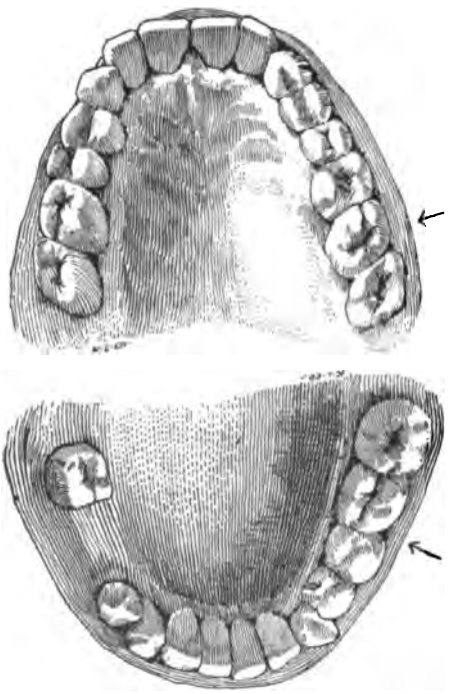
III.

A Mrs. B. had been suffering with a slight, dull and quite continuous pain in the region of the left superior third molar. Several dentists had been consulted and ascribed such causes as a "slight cavity, too small to fill," and "a dimple" (exostosis?). The tooth was slightly sensitive to percussion; the first lower molar was missing and the cup and saucer condition of inter-articulation was noticeable; and, profiting by the previous case, the distal edge of the saucer was reduced and immediate relief was acknowledged.

Digitized by Google

IV.

A Miss D., aged about twenty-three years, had an exposure of the pulp of the left inferior first molar, which was disclosed upon the removal of a large and defective amalgam filling, pain being present. The pulp was devitalized and the canals medicated and filled. The patient returned, complaining of discomfort. By reference to the Models D, it will be observed that the left superior first molar had been extracted. As the left superior and inferior molars were sensitive to percussion, their inter-occlusion was eased and the trouble ceased. It seemed at the time that part of the discomfort was caused by lateral pressure of the left inferior second molar upon the inferior first molar, thus keeping up an irritability of the pericementum of the latter tooth.



MODELS F. V.

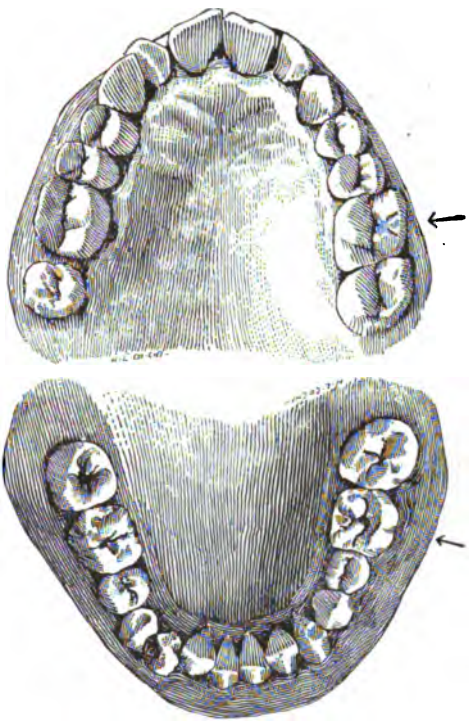
V.

Mr. F. V., aged 24 years, Models F. V., had for many months suffered discomfort in mastication with the left superior second molar; an itching sensation in the tooth was also complained of. The patient acknowledged a great sense of relief when the force and direction of the impact had been modified, and has had no return of the symptoms in more than a year. In these models, absence of the left inferior first molar is again to be noted.

Digitized by Google

VI.

The foregoing cases have been significantly associated with the loss of one or more teeth through extraction. The case of Mr. L. C., aged 35, Models L. C., is associated with a comparatively normal denture. After the large bucco-morsal cavity of the left inferior second molar had been successfully filled, tenderness was noticed in the *first* molars of the same side. The discomfort seemed to be due to the prominence of the cusps of these teeth, and comfort was restored by the use of test paper and the corundum stone.



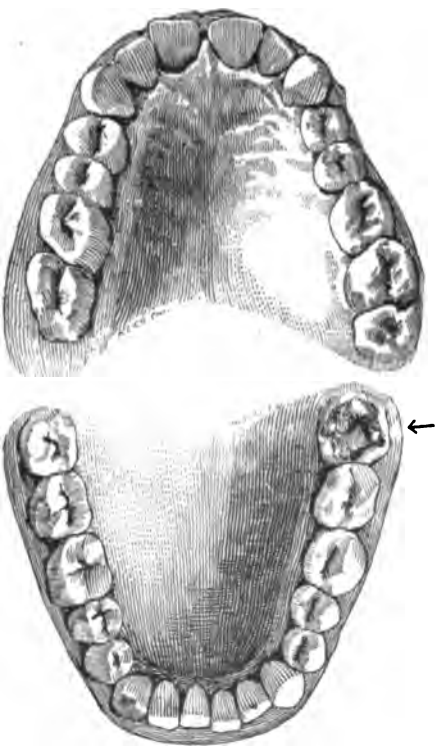
MODELS L. C.

VII.

Reference having been made to the "cup and saucer" form of inter-occlusion of the third molars, the writer has ventured to refer the same to a pivoting action of the masticatory apparatus, in some cases more pronounced on one side than on both. Models D. W. B. are submitted in this connection. A Scotch gentleman, about thirty years of age, called in 1881. The only defects to be remedied were two small cavities on the buccal and morsal aspects of the left inferior third molar. Gold fillings were inserted, which, in time, were dislodged; and both amalgam and cement fillings were resorted to, from time to time, without success, until now we have the deep,

Digitized by Google

smooth, saucer-shaped surface in the lower tooth with its converse in the upper tooth. (The concavity will sometimes be found to exist in the superior tooth and the convexity in the lower one.) That there is and perhaps always has been disproportionate muscular action, in this case, on one side is somewhat supported by the fact that, in 1888, the lingual portion of the crown (non-carious) of the left inferior second molar was fractured off by biting upon a small piece of bone in the food. The pulp, being exposed by the accident, was devitalized by arsenic, the canals were filled with a medicated paste and the crown restored with amalgam. In July, 1893, five years later, this tooth was found to be again fractured longitudinally through its buccal half and was extracted as being beyond further aid.



MODELS D. W. B.

VIII.

The main benefit that the writer has derived from the observation of these and other cases has been the conviction that the extraction of one or more teeth, especially of the inferior first molars, is liable, sooner or later, to lead to discomfort in some of the remaining teeth, and that such discomfort may, with patience, be located and relieved by the use of an engine stone.

Adjourned *sine die*.

Digitized by Google

SCIENCE—DEPARTMENT A.

SECTION III.

CHEMISTRY AND METALLURGY.

Chairman, D. R. STUBBLEFIELD, A. M., M. D., D. D. S., Nashville, Tenn.

Vice-Chairman, J. S. CASSIDY, A. M., M. D., D. D. S., Covington, Ky.

Secretary, E. V. MCLEOD, D. D. S., New Bedford, Mass.

OPENING SESSION.

The session was called to order by Dr. J. S. Cassidy, Vice-Chairman, on Tuesday, August 15th, at 2:30 P. M.

The following address by the Chairman of the Section, Dr. D. R. Stubblefield, was then read by the Secretary of the Section:

ADDRESS.

Gentlemen:

Before entering upon the work properly belonging to this department of this great congress, I beg your indulgent attention to a brief review of our professional past. The special phase of investigation peculiar to this Section is not new. From the remote past, in so far as our professional history is concerned, there have been more or less constant efforts going on. Much has been done, yet much remains. I trust this greatest gathering of dentists, great in numbers

Digitized by Google

as in ability, shall make additions to our professional lore worthy of its magnitude and character. With regard to our profession, viewed from the too narrow standpoint that has been almost the only one possible under the nature of the case, there has been too great tendency to see the worth and necessity of the purely practical. Until comparatively lately, the value of everything has paled before that of the actually practical details.

It may be argued, however, that in the early life of any great department of human knowledge, this is necessarily the natural course to pursue. It may be fairly claimed that a certain amount of tangible result must be presented before the human mind will admit the importance of the work, and after this practical showing does the theoretical come into the scope of recognized necessity. This position may seem to reverse the order of things. It may be thought that the theory of any addition to human knowledge has taken precedence to the actual putting of it into results. But looking closely we may see that some practical feature, imperfect and crude, has made its appearance first, and after that the full theory and its wider application has been deduced. This has been certainly the case with chemistry, and if the trouble is taken to observe carefully, will be found to be the case in all other fields of investigation.

It is conspicuously the case in the history of dentistry. The practical took the lead and was yielding good results before the theory was given much thought. Cure was naturally deemed more important than prevention. But since the day of a greater enlightenment has come, this order has been reversed. Prevention is justly reckoned higher than cure, and theory has become the basis of more philanthropic endeavors than anything else. We are proud to-day to claim as our highest mission that of saving—saving by *cure*, but better still, by *prevention*.

Between these two epochs, however, was a long time of growth and development. Until a devotee has risen above the first uncertain plane and reached a phase of development when practice itself does not consume his whole pow-

Digitized by Google

ers, he cannot devote himself to anything else. But once having reached a point where he has mastered the practical, he can profitably reach out in mind to that higher field of preventing, and there meet his highest obligation to his profession. Chemistry and metallurgy in earlier years of dentistry were valued at little because they were quite naturally measured by the little practical contribution they made. It was only the metallic elements that gave any assistance, and to claim that the whole list should be valued at more, was without manifest reason. It is possible to name on the fingers of one hand the elements that had a practical value. This meagre list grew when metallic compounds for dies and counter-dies were thought to be essential. Many and varied efforts were made to find some association of metals that would keep its form under all conditions, cold or hot, solid or melted to a liquid. And this period of development was possibly the longest one.

But when once more the human mind became stirred, the familiarity with practical details had reached such a status that higher ideals presented themselves. These showed themseves in both laboratory and office. Metallic compounds were intelligently formed, examined with reasonable reference to their surroundings, and made to stand upon their respective merits. In the infirmary clinical knowledge was collated, the chair taking the place of the bed in the hospital of the general practitioner. Honorable recognition as a specialist in the great army of healers—one in the spirit though diverse in the special details—gave dignity to our work and point to our investigations. The searchlight of our distinct specialty was recognized as contributing an important part to the solution of problems vital to humanity. And this is our standing to-day.

In conclusion, I wish to present some of the obligations which naturally arise from this honorable association with the other occupants of the world of science.

(1) As scientists worthy the name we are under the obligation to *classify our results*. Too long has the slip-shod method prevailed among dentists. It behooves us to sys-

Digitized by Google

tematize our labors and no longer trust to chance or tradition to keep our proofs of faith.

(2) Recognizing this first duty with the consciousness that we have not been trained sufficiently early, which must forever hamper by lack of skill, we have a second obligation and that is to demand a higher and better qualification of a fundamental kind of our youths. Too long has the idea held with the American youth that when he gets *his own consent to be anything*, he is fully prepared to properly undertake it. Self-reliance is a virtue that ought not to be undervalued, but it is worth more when properly based upon a thorough self-training. Intellectual skill previously acquired by a course through the best methods, should be recognized as the best, the necessary qualification for a course in dentistry.

(3) The third obligation is a higher appreciation in the minds of all, both students and practitioners, of the true ethics of our position. If we claim respectability and yet do not demand respect of those we come in contact by a just regard for ourselves, we are ridiculous. This respect for ourselves will grow as we raise our ideals. The sharp competition between our myriad schools renders too easy opportunity for the mercantile idea to creep in. We must keep the fountains pure, and every man has an influence to exert.

The following paper was then read:

THE STUDY OF CHEMISTRY IN DENTISTRY.

By Elbert W. Rockwood, A.M., Iowa City, Iowa.

The statistician who included dentistry in the mechanical trades rather than among the learned professions, called forth a storm of dissenting opinions from those who were laboring to advance this department of medicine. As we think, however, of the ideals of many of its students and practitioners, and as we consider its present status, we may ask ourselves whether there may not have been, after all,

Digitized by Google

some reason for the prevalence of this view of the profession. The question, then, of how dentistry may be brought to and kept upon the same plane as medicine or law, is of evident importance. The difficulties are, in many cases, enhanced by the dental student's lack of preparation. He frequently comes to the professional school with only a common-school education, and sometimes with hardly that. His mind is not well disciplined by study, and his powers of observation have not been trained. A trade may often be learned with little cultivation of the perceptive faculties or powers of reasoning. A profession can never be mastered without the highest exercise of both. A man who works by rule of thumb without concerning himself about the reasons for the rule, cannot attain to the highest success.

The study of chemistry leads a student to observe carefully, and then to draw conclusions from such observations. He can thereby understand better what the results mean, and why he performs certain operations. Of late years more importance is placed, and rightly, upon the practical or laboratory courses. It is not now deemed sufficient for a professor to describe an experiment or a test in his lectures; the student must perform it for himself. A certain amount of didactic instruction is necessary. The terms used must be given, the general principles of the science must be explained and the methods of work described. Then, too, some experiments are too difficult for beginners to perform. Hence lectures and recitations cannot be entirely replaced by practical work, but the latter should occupy a prominent place. It is true that the dentist cannot usually hope to become a trained chemist, but that is no more reason for his neglecting chemistry than for not studying the nerves and arteries of the head, because he does not expect to be an anatomist. Many points important for a chemist may be passed over rapidly, and many which are of importance to the physician will not especially interest the dentist. The fundamental principles, however, should be clearly understood, and then as extended applications made of them as possible. The beginner is apt to think, after a few months'

Digitized by Google

study of the subject, that he can never obtain satisfactory results from his labors because of the vastness of the field. He must be made to see that, having mastered the fundamentals, he will be in a position to apply them intelligently in his work, and that the liability to failure is greatest when the principles are least understood. This includes not only the common chemical tests, but all the operations where chemical action is involved.

Work in the laboratory should commence as soon as possible. There the learner becomes familiar with the action of reagents, and with the various manifestations of chemical force. His hand is trained in the manipulations necessary for a successful experiment. He becomes acquainted with the common terms of the science, such as acid, base and salt, by handling and testing these. He learns by experience the methods of preparation and properties of many of his materials, like nitrous oxide, chlorine and peroxide of hydrogen. The metals and their compounds offer a wide field for study. By the use of the blowpipe the changes are noted which are produced by the influence of heat, as well as the action of fluxes. The effect of the oxygen of the air upon the metals at different temperatures, is also learned. Experiments should also be made by treating the metals with the common acid and alkaline solvents. By these are shown the effects likely to be produced in practical work by the contact of the metals with such liquids. Having obtained by these methods solutions of the metallic salts, these may be tested singly by the ordinary reagents, then from these simple tests the methods may be deduced of detecting and separating them when several are present, and thus the student becomes acquainted with the analysis of alloys and the processes employed in the refining of metals. An understanding of the manufacture of alloys such as are used for solders or amalgams, and of amalgams themselves, is necessary, and in this connection, if not in the chemical laboratory, not only the chemical but also the physical properties should be studied. The changes in the properties of a metal by impurities, or of an alloy by varying the propor-

Digitized by Google

tions of its constituents, may be demonstrated here. Unless there is a separate course of instruction in physics, some regard should be paid to electricity and the electrical effects produced by the contact of different metals.

It is a prevalent idea that the branch of chemistry commonly spoken of as *organic* is too complex to be mastered by one who does not make a specialty of chemistry, and, if by mastering we mean a knowledge of all its numerous compounds and their transformations, this is true. However, to gain an understanding of the changes which take place in living tissues it is necessary to be familiar with some of these. The subject of fermentation is one which should be of interest to the dentist, and laboratory experiments will illustrate some of the most common forms, alcoholic, lactic and butyric, and show the substances produced by the process. In connection with these simpler forms of fermentation the putrefactive changes can be shown with the action of different antiseptics and their comparative powers of checking the growth of organisms which are the cause of putrefaction. The chemical action of each of these antiseptics must be clearly held in mind in order to be able to judge of their suitability in particular cases. The same might be said of deodorizers and disinfectants.

Many points in physiological chemistry can be practically demonstrated in the laboratory. A complete analysis of tooth substance should, of course, be made, and the properties of its constituents examined, not only as obtained from the tooth but also in the pure state. A thorough course should be taken in salivary analysis. This is as essential for the dentist as one in the urinary analysis for the practitioner of medicine. The normal constituents should be isolated and a sufficient number of pathological specimens should be tested to gain a working knowledge of the subject. The dentist should certainly be able to determine whether a case of ptyalism is caused by the iodide of potassium or some compound of arsenic or mercury.

Many of the common medicinal agents are chemical compounds, some of them being administered for their chemical

Digitized by Google

action, but all of them capable of acting chemically upon other substances which may be put into the same prescription. How many a prescription is rendered inactive or positively harmful by an improper choice of its ingredients. It is true we can go to our books and find the necessary formula just as we could consult our libraries to learn the proper course of action if an artery has been cut, but these fundamentals should be *learned*, so that they may be immediately available when they are needed. Such a knowledge can only be attained through the familiarity with such substances which comes from personal observation. This might also be said of the poisonous medicines and their antidotes, the latter owing their efficacy, for the most part, to their chemical properties.

Some work in quantitative analysis will greatly aid in the comprehension of chemical principles. It has at the same time its practical value. If the time is limited it may be confined to volumetric determinations, such as the acidity or alkalinity of solutions, for example, the saliva, also the amount of peroxide of hydrogen in solutions as purchased and the percentage composition of the common alloys. These are more easily performed in many cases than the determination by weight, especially where many students work together, or where suitable balances are not at hand. At the same time, if it is practical, gravimetric methods should also be employed.

But, after all this, which we may term the foundation of his chemical education, the dentist, in order to be to the highest degree successful, needs something more. He must not only be able to progress in the deeply worn ruts of his predecessor, but, if need be, to hew a new path, if he can shorten or make easier the way. If old methods are faulty they should be supplanted by better; if they are insufficient they should be improved. And when these better methods are found they should be freely given to the world with the other inventions which tend to conquer disease and restore health. The professional dentist can perceive most clearly the need of the improvement of certain methods or pieces

Digitized by Google

of apparatus, but may lack the knowledge which is necessary to bring about greater perfection; and this can often be supplied only by an understanding of the principles of chemistry. The professional chemist might furnish these but he is ignorant of the needs of the dentist. The *Dental Chemist* who is thoroughly acquainted with both professions is rarely met with. Improvements must come largely either from the dental profession or from the manufacturer; the former is often unable to furnish them, and if they come from the latter they are immediately covered with patents. One aim, then, to be attained by a dental education, as in others which fit men for practical life, is to give such training as will enable a man to improve existing methods and invent new ones. This may be accomplished by giving the student some point to study which is important in his work and which has not yet been completely explained. I am aware that many will say that there is not sufficient time in the ordinary course for such studies. This is a forcible objection, it is true, with the time at present at our disposal. We should, however, look ever forward toward better things. When the term of study is lengthened, as it must be to keep pace with the advances of the science, we shall be able to attain nearer to our ideas of perfection than we now can. But we must remember that we have not yet attained it and be ready when the opportunity for advancement presents itself. Unless the student can apply his studies to his work and make the application himself their benefit is largely lost to him.

There are many subjects connected with the profession which need to be investigated and which can be intelligently investigated only by one who has a knowledge of theoretical points as well as practical needs. For a student, these researches should be confined to some limited field. It is of more importance to seek carefully through this than to ramble vaguely over an extended territory. Questions are arising daily which need to be answered by research. It is perhaps needless to refer to more than a few of them. New remedies are being continually recommended, or, quite often,

Digitized by Google

old ones or combinations of old ones under new and awe-inspiring names. What is their composition? Is their action chemical? Will it probably be beneficial or injurious? The decay of the teeth should be better understood. What produces favorable or unfavorable conditions? What is the action of the many disinfectants in use? and when should the different ones be employed? Do the sulphides or oxides of the metals which may be formed on amalgam fillings influence the decay, and if so in what manner? No one who is conversant with the many substances employed for cements and fillings believes that perfection has been reached in this line, even if he is able to use them all skillfully. The perfect filling is yet to be discovered—a material which may be easily inserted and which will wear as well as the tooth substance without injury to it, and which, at the same time, resembles it in appearance so as not to be easily perceived. There is also much to be learned of the alloys. Do the metals cause an electrical action when the amalgam has set in the tooth so as to hasten or prevent its decay? The study of influence of small quantities of a metal upon alloys needs investigating. Do the minute amounts of gold and platinum often used—one-tenth to three-tenths of a per cent., for instance—have a decided effect upon their properties? Tests should be made to determine the best combination and the proper proportions of these in dental alloys. There is a field for observation, too, in the action of the mercury contained in amalgam fillings and in the coloring matter of plates, as to its state, and whether it produces the effects often ascribed to it upon the tissues of the mouth.

Every dental practitioner can furnish queries from his own experience, and it is needless to give others. Their number is practically limitless.

In this short paper I have attempted to show some of the benefits which the study of chemistry may confer upon the dental profession, and how the study may be pursued. As we see the work which is being done in some of our dental colleges, I think we can conclude that its importance is

Digitized by Google

becoming better appreciated, but there is in many cases still room for improvement.

There is no reason to doubt that in the future it will occupy a prominent place among the studies which will best fit the dental student for his professional work.

[There being no discussion, and but one other paper assigned to this section, that of Dr. W. V. B. Ames, of Chicago, entitled "Oxyphosphates," it was, on motion, referred to be read before Section VI, on Operative Dentistry.]

Adjourned *sine die*.

Digitized by Google

Digitized by Google

SCIENCE—DEPARTMENT A.

SECTION IV.

THERAPEUTICS AND MATERIA MEDICA.

Chairman, F. J. S. GORGAS, A.M., M.D., D.D.S., Baltimore, Md.

Vice-Chairman, N. S. HOFF, D.D.S., Ann Arbor, Mich.

Secretary, GEO. E. HUNT, M.D., D.D.S., Indianapolis, Ind.

Report of the Section made by JUNIUS E. CRAVENS, D.D.S., Indianapolis, Ind.

OPENING SESSION.

Called to order at 3:30 P. M., Tuesday, August 15, by the Chairman of the Section, Dr. Ferdinand J. S. Gorgas, who delivered the following address:

Gentlemen:

I extend to you as members of "The World's Columbian Dental Congress" a cordial welcome to the meetings of the Section on "Therapeutics and Materia Medica." The large number present at its organization is an indication of the interest manifested by the dental profession in the important subjects to which the proceedings of this section will be devoted. For many years past the nature and use of anæsthetic agents, and especially those of the class recognized as local anæsthetics, have engaged the attention of dental practitioners. In the use of drugs, and especially those possessing toxic properties, whether for internal or external

Digitized by Google

administration, we should possess a comprehensive knowledge of their nature and effects, accompanied by a sound and penetrating judgment joined to a love of progress, which a discriminating spirit of inquiry so tempers, as to induce us to accept nothing new because it is new, and abandon nothing old because it is old, and to estimate either according to its relations to a just logic and experience, which gives an assurance of safety. I do not agree with those who oppose discussing in a dental congress the effects of the various drugs which have, within a comparatively brief period, been brought to the notice of the dental profession in the form of popular nostrums for obtunding the sensibility of the dental organs, and for which is claimed entire immunity to pain, and absolute safety, giving as a reason that such investigation may prove an advertising method, or at least result as such. On the other hand, I believe that it is our duty to make ourselves acquainted with the source, medical properties, action and therapeutic uses of all agents which are capable of exciting curative or toxic effects according to their combination, quantity applied, or method of application.

The antiseptic treatment now so generally adopted against the development of fermentative organisms, and which yields most satisfactory results when it is employed to prevent as well as correct putrefaction, will also receive due attention in the form of papers presented by foreign as well as native dental practitioners, and from which, I have no doubt, much good will result to all who may enjoy the advantage of listening to them, and also to the discussions which will follow their reading before this Section. We recognize the fact that the substances employed as antiseptics should act either directly on the bodies in which putrefaction is occurring, or might occur, forming with them combinations that are not susceptible of the decomposing action of a ferment; or they should act indirectly by destroying their vitality, or otherwise preventing the development and propagation of the organisms of which the ferment is composed. In this respect we are able to distinguish antiseptics

Digitized by Google

from disinfectants, as the action of the latter is directed only towards the existing causes and offensive or deleterious products of a class of changes which are more comprehensive than those implied in the term putrefaction.

With these brief remarks, we will now proceed with the business of the Section.

The following paper was then read:

METHODE D'ANESTHESIE LOCAL A L'AIDE DE LA COCAINE.

Par D. Caracatsanis, M.D., Athènes, Grèce.

Vous connaissez tous, chers confrères, les dangers des injections des cocaïne pour l'extraction des dents sans douleur.

Ses effets narcotiques sont surprenants, mais malheureusement, ils sont souvent suivis d'effets fâcheux pour le patient, qui y á même quelquefois trouvé la mort.

Depuis le congrés dentaire de Paris, ceux qui y etaient présent se souviendront sans doute des discussions assez vives qui se sont soulevées â ce sujet.

Il y á autant de partisans que d'ennemis, Depuis je me promis donc d'expérimenter de voir, si l'on ne pourrait pas substituer aux injections, une mánière moins energique pour procéder á une anesthésie locale á l'aide de la cocaine.

Mon idée était que si les effets étaient complètement localisés, elle répondrait entièrement à nos désirs c'ést-à dire, anesthésie complète.

Cette maniére d'appliquer la cocaïne sans danger, je l'ai trouvée et je l'ai pratiquée—depuis plusieurs années avec le plus grand succès.

J'ai eu presque toujours des nouvelles des personnes operées, elles n'ont eu à se plaindre de la plus ligère indisposition.

C'est done avec la plus grande confiance dans ma méthode que je viens vous l'exposer.

C'est une opération simple, à la portée de tous, le seul inconvenient est qu elle soit un peu longue.

Digitized by Google

Manière d'opérer. Je commence par badigeonner la gencive autour de la dent à extraire, avec un instrument d'acier, entouré de coton trempé dans une solution d'acide phénique a 2 pour cent. que j'entretiens chaude, et j'enduis ensuite cette mèche de sels de coçaïne non dissous Une fois la gencive un peu insensibilisée, je commence par la décoller légèrement autour de la dent, à l'aide d'un bistouri, et j'introduis dans l'orifice pratiqué, des mêches de coton enduites de cocaïne comme je l'ai indiqué plus haut.

A mesure que l'anesthésie s'avance, j'agrandis l'orifice sur une profondeur d'à peu près un centimêtre autant vers le côté buccale, que lingual.

J'ai soin de recommender au patient de ne pas avaler sa salive, afin d'éviter la moindre absorption de cocaïne. Après m'etre assuré, en touchant fortement ces parties avec un instrument d'acier qu'elles sont bien anesthésiées, je fais faire par mon aide des pulverisations ainsi préparées.

Chloroforme, - - -	25 gr.
Ether sulfurique, -	40 "
Menthol, - - -	3 "
Cocaïne,	1 "
Essence de menthe, -	1 "

et j'extrais la dent, sans les interrompre.

Le seul cas ou je n'ai pu obtenir un réel succès, ést quand il y a inflammation.

Je me propose, pour vous convaincre complétement de ce que j avance, d'en faire l'expérience devant votre honorable congrès.

The following paper relating to the same subject was then read by the Chairman of the Section, in the absence of the author:

COCAINE INJECTIONS FOR THE PRODUCTION OF ANÆSTHESIA.

By Anthony Bleichsteiner, M.D., Graz, Austria.

Under this same title I presented in the year 1889, in Paris, at the "Congrès Dentaire International," the results

Digitized by Google

of my experience with cocaine injections for the purpose of painless extraction of teeth.

Up to that time I had made more than 3,000 injections with 5 per cent. solutions of cocaine hydrochlorate. My method of injecting I then demonstrated at the "École Dentaire de Paris."

To-day I shall speak about cocaine with the experience I have collected in executing more than 14,000 injections. If I have been called a cocaine enthusiast in Paris, because I have defended the suitableness of the 5 per cent. cocaine injections with particular warmth and conviction, I esteem myself happy to be such a one in the full sense of the word, as I have experienced the good qualities of cocaine more and more by using it continually.

Gentlemen, more than 14,000 injections is a great number of trials, which should prove instructive to the calm observer, and this is the reason why I shall claim your patience in favor of a topic which is such an old one, and which has already been treated so multifariously, though in contradictory ways.

I shall now give you a description as short as possible of:

I. The preparation I use;

II. The character of the solutions;

III. What quantities of cocaine hydrochlorate that have been used and for how many injections;

IV. My syringe;

V. My method of injecting;

VI. My opinions concerning the intoxicating effects following cocaine injections.

I.

In December, 1886, I made the first trials with cocaine hydrochlorate (Merck). The preparations for the first trial I procured myself from an apothecary, a friend of mine, 50 grammes in the original package. The other quantities I bought of Mr. E. Merck, of Darmstadt.

II.

I began with 20 per cent. solutions. After several trials I diminished them to 10 per cent. solutions, and since 1887 I

Digitized by Google

used 5 per cent., but since March, 1892, only 5 per cent. solutions.

At first I renewed the solution immediately before every injection, but when I came to execute every extraction with cocaine anæsthesia and when my assistants did the same, I took care to prepare the cocaine solutions in quantities of 10 fluid grammes each, and I used for the sterilization of the solutions corrosive sublimate ($HgCl_2$). I took 10 grammes sublimate solution containing 1 gramme of sublimate for 5,000 grammes of distilled water, and dissolved in it 5 decigrammes as long as I used 5 per cent. solutions, and now I dissolve in 10 grammes of the same sublimate solution 3 decigrammes of cocaine hydrochlorate, by which I obtain a 3 per cent. solution of cocaine hydrochlorate. A drop of this solution contains 3 milligrammes of cocaine hydrochlorate.

III.

In the manner previously mentioned I have, since the year 1887, used 600 grammes of cocaine hydrochlorate (Merck) exclusively for injections; and according to calculation I have made 14,000 injections with it.

Four hundred and fifty grammes were used for 5 per cent. solutions until the end of March, 1892, that is 9,000 grammes of injection fluid containing 5 per cent. cocaine. From March, 1892, up to the present day 150 grammes of 3 per cent. solutions have been used, which makes 5,000 grammes injection fluid of 3 per cent. cocaine.

Nine thousand and 5,000 are 14,000 grammes of cocaine solutions (or 14 litres), which would be equal to as many injections, if each time a whole syringeful equal to 1 gramme of fluid had been used. But both I and my assistants have only in rare cases used the contents of a whole syringe in order to obtain the local anæsthesia before the extraction, and therefore I can decidedly affirm that the 14,000 injections, the exact result by calculation from the used quantity of 600 grammes of cocaine hydrochlorate, fall short by 2,000 of the number really made, so that, properly speaking, from the year 1887 up to this day 16,000 injections with cocaine have been applied.

Digitized by Google

IV.

My Syringe.—I used the "Pravaz" syringe only for a short time for the injections. Both I and my assistant at that time, the dentist Charles Schnickel, who is now practicing in Hamburg, had the idea of making the straight hypodermic needle of the syringe more fit for its application in the mouth by a bayonet-shaped curve, and after many trials the syringe received its present shape.

It consists of a glass cylinder dressed in hard rubber; its pipe is curved in the shape of an S, and in such a way that the prolongation of the end of the pipe forms with the prolongation of the axis of the glass cylinder an acute angle of twenty to thirty-five degrees. The piston rod of the syringe is divided into ten parts, so that one stroke answers to one decigramme of fluid or a drop. The injection needles have different lengths, 10 and 20 millimetres respectively, in order to be able to adapt them more easily to the different dimensions of the upper and lower jaw. Their sharpened ends are as short as possible, about 2 millimetres, therefore the length of the puncture can be very short, which is most advantageous to the gums. On the handle of the syringe there are two continuations for placing the forefinger and middlefinger.

V.

My Method of Injecting.—I will now mention in a few words my method of quickly preparing the solution of 10 grammes of injection fluid. I have phials with a wide neck which contain 10 grammes of fluid exactly up to the neck. The phial is filled with the sublimate solution already mentioned, 1 to 5,000. I now add 3 decigrammes of cocaine hydrochlorate, which is weighed in paper cases. By shaking the solution it is made ready for use in a few seconds. The filling of the syringe is done by dipping it without the injection needle into the solution and then pulling the piston rod.

The Injection.—Now I have reached the capital point of the whole proceeding. I inject only into the gums near the tooth to be extracted, and I always try to maintain the in-

Digitized by Google

jection needle parallel to the curve of the jaw. This is very important, for if I direct the point too much against the epithelial side the uppermost layer of the epithelium is lifted up by the slightest pressure on the piston rod in the form of a transparent blister, disappears instantly after stopping the pressure on the piston rod of the syringe. This blister, which disappears so quickly, makes on me the impression that its contents would at once get into the cavity of the mouth by diffusion. Such injections are of no value at all. But if I point the needle too much toward the jaw then I discover only too soon that I have struck the socket. Now I may press as long as I like, I shall not get anything out of the syringe. The piston rod remains immovable and in trying to overcome the obstacle by forced exertions the piston rod or the glass cylinder breaks, as I have sometimes experienced with my syringes. I must, therefore, leave the handling of the needle to the feeling of my fingers between which I hold the syringe after the manner of a writing-pen on the glass cylinder and move it on between the periosteum and the socket, and this place is where the injection fluid is pressed by the tension of the periosteum into the bone tissue of the alveolar wall and from there into the periosteum. The injection proves itself successful by the gums growing more and more pale as if a white mass of the injection had produced this paleness, observing at the same time a transparent circumscribed blister already mentioned, which resembles very much a swelling from ranula.

Four horizontal and four vertical punctures of one drop each, generally suffice. I usually begin at the mesio-labial papilla of the gums, which is most easily accessible, and I inject two or three millimetres distant from the gums, pricking toward the disto-labial edge. In doing so I must use the precaution already mentioned to remain as much as possible parallel with the curve of the alveolar wall. If the injection has succeeded well after the first horizontal puncture, of which the growing paleness of the gums is a sure criterion, the next puncture being made in the pallid place, it is not felt by the patient. In this second puncture the

Digitized by Google

needle is again moved in the direction of the disto-labial edge of the gums, and after another injection has been successfully made, the whole labial surface of the gums will have grown pale, perhaps even the two edges of the gums mesially and distally from the tooth. In the same way I prick the lingual edge of the alveolar wall, first horizontally from the mesio-lingual edge of the gums and then again within the reach of the pale spot after the first injection. The punctures and their effects must be continually controlled by the means of the mouth-mirror, and the growing paleness of the gums must be carefully observed. If during the injection considerable of the injection fluid should flow back along the injection-needle, which happens pretty often, then the injection must be immediately interrupted, a new puncture and new injection must be made a little distant from the first and in another direction. In order to avoid swallowing the cocaine solution, which may have flowed back, and the anæsthesia and paresis of the uvula connected with it, which mostly causes a tendency to vomit, I make the patient rinse his mouth immediately after every puncture and only then do I continue the process.

If, by the horizontal punctures, the gums grow pale all around, then I proceed to make the vertical or the parallel punctures longitudinal to respectively the root or roots of the tooth. I generally make four of them, successively, first the labio-mesial, the labio-distal, then the linguo-mesial, and the linguo-distal puncture. Especially with the linguo-vertical punctures the assistance of the mouth-mirror is indispensable. At every puncture parallel to the length of the tooth the patient is immediately asked whether he feels the puncture, and only in the affirmative case shall the injection be effected. If in case all four vertical punctures have been still felt, the injection must be every time vertical, then it is recommended to make a few more vertical trial punctures in the immediate space between the places where the punctures have been made, in order to be quite sure that all around the socket of the tooth to be extracted, there is no sensitive place for the needle to be found. If a difficult

Digitized by Google

extraction is foreseen, I inject also the septum of the gums between the adjacent teeth in the form of vertical puncture. And now I have the consolation to have thoroughly distributed the injection fluid all around the socket. The length of the horizontal punctures shall not exceed five millimetres, while the vertical punctures shall be made as long as possible at least above ten millimetres. Many authors advise to wait from five to ten minutes after the injection has been made before extracting the tooth. I consider this superfluous for the anæsthesia, for the toxic effect of the cocaine injection I consider it even not advisable, and for that reason I extract immediately after the injection, and to this proceeding I ascribe the circumstance that I have to experience comparatively very few and very slight accidents. And now as to my opinion about intoxications following cocaine injections.

Intoxications after cocaine injections only follow in my experience if of twenty or ten per cent. solutions a half or even a whole syringe full has been injected. In this case if the solution be twenty per cent., either one decigramme or two decigrammes of cocaine hydrochlorate has been injected; but with ten per cent. solutions, five centigrammes or one decigramme of cocaine. These are doses, which are too high under all circumstances. I only had instances of real intoxications in the beginning of my cocaine injection, and as long as I injected such doses. I then found the following symptoms:

Dilated pupils, dryness of the throat and mucous membrane, tendency to vomit, a feeling of giddiness, tingling in the ears, a slow pulse, which could easily be oppressed and stopped, and cold perspiration on the forehead, in the face, on the hands or over the whole body, a high degree of anæmia of the face, chill, now and then even shivers, torpidity of the muscles, tonic spasms, apathetic languishing, a soporific state; in particularly alarming cases, interruption of the sensory function, lethargy, decay of bodily strength and collapse.

In general, I must say that in my experience I have

Digitized by Google

in the beginning often mistaken for intoxication hysterical paroxysms or even epileptic fits. My further experience has taught me to distinguish exactly the intoxications from the above mentioned nervous fits. Just as clonic spasms, that is to say convulsions of the muscles, with a quick change of enlargement or of straightening of the pupils showed themselves, cases of reflex symptoms of hysteria or hysteric epilepsy, or real epilepsy. When, after proper treatment and attendance, such alarming fits had been overcome, I asked the patient himself, or his or her companions who had accompanied them to my office, whether this kind of fits had made their appearance at certain intervals, or on certain occasions that tended to excite the nerves of the persons, before he or she had undergone any dental operations, and my question was always answered affirmatively. In most cases it could be stated that such an attack previously described manifested itself exactly as the reflex spasms.

By this experience I have studied exactly all intoxications after cocaine injections, and I have found few reasons to believe in these fits as a consequence of the procedure, but I have almost always been able to range the respective description into the series of one of the reflex symptoms already mentioned. Since I have used five per cent. solutions, the accidents described answered more the species of reflex actions. To be sure I have already injected fifty milligrammes, that is to say the whole contents of a syringe, and it may be probable that at one or another time too little was injected, and so with very nervous persons these nervous spasms may have been caused by a feeling of pain from the extraction, though ever so minimized. That feelings of pain with nervous persons can be the cause of the reflex symptoms has often been proved. I remember a case when three sound and firmly fixed teeth, the cuspid, the lateral incisor and the first bicuspid on the left side of the upper jaw, were extracted from the mouth of a very nervous elderly lady at one sitting for the purpose of replacing them by artificial ones. After an injection of two syringes and a half of a five per

Digitized by Google

cent. solution, that is to say 125 milligrammes of cocaine hydrochlorate, not the slightest ill consequences were to be noticed. Two days later I wished to remove a very loose root of the central incisor on the left side of the upper jaw of this same lady, and I injected only two drops of the five per cent. solution, that is to say ten milligrammes, after extracting it, when she fell back in the chair and her face lost its color, a symptom that was followed by convulsions of the muscles of the face, the arms, the legs and of the trunk. The color of the face changed alternately from paleness into redness, clonic spasms passed gradually over to tonic spasms, by which the muscles of the floor of the cavity of the mouth were especially violently seized. After this kind of spasms had set in, a secretion of perspiration was to be observed. The sensory function was annulled for a short time, the pulse grew slight and could easily be suppressed, the respiration became short but frequent. By a horizontal position, cold poultices applied on the forehead as long as the clonic spasms lasted, loosening of the dress, and doses of cognac, as well as making her swallow ice cream, she was finally able, after an hour, to sit up a little. The first words she uttered were: "Why, doctor, what pain you have made me suffer; me, who cannot bear any physical pain at all! Only injuring my finger with a needle I am sure to be attacked by spasmodic fits." This lady's confession will do justice to my assertion, that in this case just mentioned, the spasmodic fits would certainly have been taken for intoxication if the former experience were not contradictory to that supposition.

Taking in consideration that two days before 125 milligrammes of cocaine hydrochlorate had been applied with the best result imaginable, and that ten milligrammes of cocaine hydrochlorate produced, two days afterward, such a bad effect; the conclusion is easily justified, that the symptoms of spasms were not caused by the doses of cocaine hydrochlorate, the more so, as the lady herself informed me of her being subject to hysterical paroxysms. Another instance will prove how delicate people often are as to their

Digitized by Google

nervous constitution. Two gentlemen whom I attended were of so nervous a disposition that when talking about the toothache they had felt, were suddenly attacked by hysterical fits. Before anything was known of nitrous oxide and cocaine I have frequently noted syncope and hysterical fits and similar nervous reflexes, and I can only say that now, when using only three per cent. cocaine solutions, I have but rarely perceived reflex symptoms, never real intoxications. A confirmation of this I have gained by the bad experiences I had with twenty and ten per cent. solutions, I find no occasion at all to be afraid of intoxication. Now I must only be careful with very timid and nervous patients, that the first puncture shall not excite them, which can be avoided by brushing the gums with cocaine before the injection is applied, and then the first puncture is to be made very gradually, though as quickly as possible, and after very little of the fluid, not even a whole drop, has been injected, the needle is to be pushed on a little further, upon which a greater quantity can be injected at once. With persons of nervous disposition, the dentist must try to quiet their excitement by showing himself perfectly composed and at ease in order to gain their entire confidence and trust; having thus succeeded, the whole procedure may be properly executed. The greatest influence over nervously excited persons is to be acquired by the calmness of mind and visible confidence of the operator, both in himself and his art, which, I am sorry to say, can only be taught by long practice with cocaine. If I have succeeded thus far in clearly representing to you, gentlemen, the method of my cocaine injections, I have still to remark that the acquirement of the technical part of the application causes great difficulties to the beginner, because in the first place the technical part of the injection is decisive for the real success, and while a beginner will be successful, it will necessarily be in but a small degree. But I beg you not to put a restraint upon your intentions as to this topic, for with a three per cent. solution you can only experience nervous reflexes which, however alarming they may seem, have nothing dangerous in themselves.

Digitized by Google

Discussion of the two preceding papers.

DISCUSSION.

DR. NORMAN J. ROBERTS. Foreign dentists have been experimenting with a new preparation called tropacocaine. It is rather expensive, costing 20 cents per grain. The tropacocaine, in about a two per cent. solution, combined with an antiseptic, gave better results than cocaine in four per cent. solution, without any of the disturbance that cocaine sometimes produces. Some of the foreign journals give a number of experiments by members of the different foreign faculties, and my experiments agree with theirs, though not so extensive. Tropacocaine is far superior to cocaine for hypodermic injection, producing longer and more thorough anæsthesia without cocaine symptoms. Of course, if it should be used in very large doses, as in four, five, and six per cent. solutions, it would produce an effect, but there seems to be no toxic effect from a two per cent. solution.

DR. L. N. SEYMOUR. About six or seven years ago, I experimented with cocaine and carbolic acid, in the proportion of two to one in combination, and in the course of ten minutes I could extract the tooth without any perceptible pain. I used two drops of a twenty per cent. solution of hydrochlorate of cocaine and one drop of Merck's carbolic acid, simply as a local application for from five to ten minutes, by means of pledgets of cotton.

DR. ROBERTS. Is it not a fact that from a two to four per cent. solution of cocaine, properly antisepticised and combined with chloral, in a certain proportion, is practically safe if it is properly applied? It is a fact so far as my own experience is concerned, in probably two or three thousand extractions, and that it is nearly instantaneous in effect.

A year or two ago, when the local anæsthetics were being advertised throughout the country, I gathered all I could get hold of and had them analyzed, and I found that they were composed of from one to three per cent.—sometimes ten per cent.—of cocaine with other drugs in combination, and this paper just read bears out my own experience in test-

Digitized by Google

COLLEGE OF DENTISTRY University of California

ing cocaine. The majority of the combinations that we have are antisepticised by means of carbolic acid. Experimenting with them clinically, I found that a great majority of them contained too much carbolic acid, and unless the gums were thoroughly lanced and bleeding ensued, there would be either sloughing of the gums or necrosis of the process in a little while. I have had one or two of the combinations recently offered analyzed, and found a small per cent. of tropacocaine (one-half of one per cent.) in some of them, consequently they are recognizing the fact that it is a superior drug for that purpose. I find two per cent. of cocaine does just as much good as four per cent. In injecting the cocaine or any drug into the gum, it should be injected in a direction which would force the blood away from the extremity of the capillaries, so that it will go forward. If you commence to force the other way, your cocaine will back up into the capillaries and you cannot get that perfectly white appearance. If you commence parallel with the top of the gum and direct the injection toward the blood-centers, you will get tissue perfectly white, and absolute anæsthesia will follow instantly. The main thing now is as to the effect of the different antiseptics in connection with cocaine, because I consider it absolutely settled that a two or three per cent. solution of cocaine will do the work harmlessly.

DR. PRUYN, Chicago. I made a long series of experiments with cocaine. When cocaine was first brought into notice, I began to use it locally within the cavity of the tooth, thinking that possibly some good results might follow, as we heard from the experience of the gentleman from abroad that it had such wonderful effects on the conjunctiva. Of course, results were nil, and I gave it up for a time, and then commenced experimenting with the use of cocaine hypodermically. I think it is five years since I presented a paper at the twenty-fifth anniversary of the Chicago Dental Society on this subject, giving the result of some five hundred cases in actual practice; also of a large number of experiments upon the lower animals. At the time little had been said and written upon the subject, and I was fearful of

Digitized by Google

entering upon any serious experiments upon the human subject until I had assured myself by experimenting upon the lower animals; so I sacrificed dogs—many of them—for that purpose. I wanted to know what the results would be if by any means an overdose should be given, and what I should do in a case of cocaine poisoning.

This series of experiments I give now every winter in our college before the medical and dental class. As a rule I take twelve dogs, and pair them so that I have two of about the same size, general conditions, form, and breed, so that there would be the least possible difference between them, then I take one of the dogs and inject cocaine enough to kill him. He then goes through all the usual toxicological effects. The other dog is fortified with an injection of morphia, and to him I give just as large a dose of cocaine and invariably save his life. The dog without the morphine as an antidote dies a very hard death. Cocaine paralyzes the centers of respiration, the breath is shut off, the animal struggles to breathe, and goes through tetanic symptoms with paroxysmal exacerbations. For a moment or two he will struggle for breath, and then there will be a cessation, followed by another exacerbation, until finally he goes off into a tetanic spasm.

A case in practice may be of interest. Just a year ago I took my little son, a lad of ten, to the office of a rhinologist for treatment of the large turbinated bone for some catarrhal trouble. This gentleman was one of the ablest in his profession in Chicago, who used cocaine recklessly, we might say, upon the tissue of the nose. They do not use it just as we do, but by swabbing a ten per cent. solution into the nose. Then when they have produced sufficient anæsthesia, they operate with the electrical cautery. I went with the lad, and at about half-past ten in the morning they applied the cocaine, and he instantly dropped to the floor. We applied artificial respiration, and in a few minutes he recovered.

Nothing further was done then, but about a week later I went again, and having heard that coffee had been used as an antidote I gave the boy a cup of strong coffee, and, not

Digitized by Google

being accustomed to it, he of course felt the stimulating effects to a considerable degree. We went to the office of the doctor, who applied the cocaine just as he had before, in even a stronger solution, and the lad went through the operation with no toxic symptoms whatever. One side only was operated on then, and a week later I took the boy the third time, but did not fortify him with coffee, and after the operation no effect was noticeable until he walked about a block on the street, when he began to be troubled with his breathing. I laid him upon the floor and applied artificial respira tion, working with him for about an hour, he having all the time these paroxysmal exacerbations. In this case coffee seemed to be an antidote, as the success of the second administration of the cocaine can be attributed to nothing else.

In actual practice, a two per cent. solution with about a half per cent. solution of salicylic acid to preserve it, answers just as well as a four or six or eight per cent. solution.

The writer of the paper spoke about calmness upon the part of the operator being a prerequisite to success in the use of cocaine. There is no doubt about that. Cocaine makes a person very fearful, and if there is any trepidation shown upon the part of the operator, that feeling is conveyed at once to the patient, and he suffers needlessly.

I have used in some cases hot water simply, thinking that possibly there might be something in the pressure of the liquid of the solution of cocaine upon the terminal ends of the nerves that had something to do with obtunding, and it has done wondrously well. I dare not say it is just as good as cocaine, but in the few cases I have used it, it has proven that it is worth something. I would like those who are experimenting in this line to try it, and find if we can get any results from it.

DR. CHEANEY. I have tried tepid water numerous times, and find it very effective. If the patient does not know the difference, it is just as good as cocaine.

DR. PARKER. Isn't that a hypnotic effect? You might just as well use cold water. I would like to hear from some gentleman who has experimented with cocaine on abscessed teeth, or one that was abscessing.

Digitized by Google

DR. A. W. FREEMAN, Chicago. I have used it in abscessed conditions, and my results were very unsatisfactory unless I went beyond the line of inflammation, then it proved satisfactory.

DR. PARKER. The only way I have had good results in abscessed teeth with cocaine is to first spray the gum slightly, then inject the cocaine thoroughly into it, as the paper states. If you can start at a point, force the cocaine along and keep following it up, inserting the needle at the point which is anæsthetised, you can relieve the pain; but if you insert the needle into highly inflamed tissues, you will cause the patient more pain by the first injection than you will by the extraction of the tooth.

DR. J. E. CRAVENS, Indianapolis. It would appear, if the discussion were permitted to lapse at this point, that the use of hypodermics, or particularly of cocaine, was valuable only for the extraction of teeth. I apprehend that a very small percentage of the practitioners who are present are willing to admit that they use local anæsthesia so very often for the extraction of teeth, because they would have to admit that they do a great deal of extracting. I was very sorry that these two papers read did not have reference to something else.

I hope, Mr. President and gentlemen, that we are not degenerating into a profession of tooth-pullers. Local anæsthesia is beneficial for other purposes in dentistry than simply the extraction of teeth. I have had some experience in local anæsthesia by the use of cocaine in the operation of scraping the roots or operating in the pus-pockets of pyorrhœa alveolaris. I apprehend the operation without anæsthesia is about as painful and certainly much more protracted than that of extracting a tooth.

My method is to make a saturated solution of the hydrochlorate of cocaine in chloroform.

Before I operate for pyorrhœa alveolaris I apply the cocaine directly, not by hypodermic injection, but by introducing a small syringe into the pocket, and inject about a drop, as nearly as I can get at it, forcing it in with a plunger

Digitized by Google

syringe in such a way that I know it will go to the farthest part of the pocket.

Now, hot water is necessary in my method. By the application of cocaine without preceding it with water I do not get the results.

I precede the cocaine application in the pocket by washing the pocket with the hot water, and I use water just as hot as I can get it there (140° F.) and not burn, just short of the point of scalding. I use the ordinary little syringe that holds, I suppose, half an ounce, and I discharge one, two, three, perhaps four charges from that syringe into the pocket before I apply the cocaine at all, then inject a single drop of cocaine. My idea is not to overflow the pus-pocket and have the cocaine float about the mouth.

The application of cocaine is guarded; that is, I keep the saliva away and protect it for perhaps two or three minutes, then I wash again and apply the cocaine. I make three applications of cocaine in succession, sometimes four. After the third application in most cases, and certainly always after the fourth, I can go to the end of the root—the apex if the pocket goes that far—and can scrape the root, as I have done in some cases until my conscience revolted, because I thought I was hurting the patient, and I have been told there was no pain felt.

It requires about fifteen minutes to make the three applications; one will not do, two will not do, but three nearly always will do, and four will do it in every case that I have encountered.

Now, one other point in regard to the cocaine escaping about the mouth. If in making these injections the dentist will place some absorbent cotton around the tooth and place it compactly about the sides, it will prevent overflowing. There is always one side where it will run out, and if you know the direction it will take by gravitation, place the pledget of cotton there, and it will take up more than could possibly escape. In case it does escape and the patient experiences the symptoms of loss of the sense of taste, stiffness of the cheeks, etc., I dissipate that in from one to two

Digitized by Google

minutes by simply rinsing the mouth with alcohol or whiskey.

DR. HEWETT. I can corroborate what the last speaker has said with regard to the application of cocaine in pyorrhœa alveolaris. I can also corroborate what Professor Pruyn has said, for in the last five years I have been in the constant use of cocaine, but never once as an injection; and I never expect to, because I do know that if a half to a grain of cocaine is taken into the circulation and goes to the heart, unless it is counteracted by some such stimulant as coffee, or morphine, which is better, or by atropia, which perhaps is better still, which accompanied by stropanthin is better than all, it is almost sure death.

It is dangerous to give an hypodermic injection, unless the injection can be localized or the effect counteracted by a heart-stimulant.

About the local anæsthesia of cocaine, that there is such an influence nobody doubts. I have used it repeatedly for operations upon the eye without any pain whatever, and I have used it about the mouth in operations of removing tumors, but never by hypodermic injection.

A strong solvent of cocaine is ether. Some of the fats will hold in solution a very large quantity of pulverized cocaine; these will be taken up very readily into the tissues.

Cocaine should be purchased in large crystals, because if it is purchased in fine powder you will almost always find it adulterated, scarcely ever pure. The prisms should be in their primitive rhomboidal form, clean and large; then they should be pulverized very thoroughly. Dip the point of a moistened instrument in this pulverized cocaine and carry it to whatever point you choose, and the effect is almost instantaneous.

I am in the habit of using it in that way, in the treatment of pyorrhœa alveolaris. I carry cocaine upon the point of instruments up into the pockets, and by moving the instrument around on the gums, with very excellent effect. I use the cocaine solution in spray or as a pigment, a method which I published in the *Dental Review* not long ago.

Digitized by Google

In the application of the gilling-twine to hold the rubber-dam, we ought to obtund the gum by applying a little cocaine before the application of the rubber-dam, or moisten the gums underneath and then drive it up home, and that holds it and the patient cannot swallow it. Then apply the twine, and you are merciful. The same thing will apply in separating the teeth, as those who have used the Perry separators—the cruelest thing almost that was ever invented—can testify.

There is a large range of application where cocaine is exceedingly useful, but I felt it my duty to the profession to call attention also to its danger as a hypodermic injection.

DR. PARKER. In the early formulas adopted in the use of cocaine, it was believed that small doses of atropia acted as a heart-stimulant and counteracted the effect of the cocaine; and I know in my own first experiments I had a number of formulæ put up with small doses of atropia upon about the following plan: Carbolic acid was used to produce coagulation of the albumen and prevent absorption from the localized spot, also to prevent fermentation of the mixture; chloral to produce local anæsthesia, and atropia to act as a heart-stimulant. Now, in my experience, which was quite extensive, I found the combination of other drugs with carbolic acid and chloral was simply useless, because no necessity arose that demanded a heart-stimulant; by the administration of aromatic spirits of ammonia the moment there is any sign of muscular paroxysms, generally all the symptoms pass away; or by giving alcohol, which seems to restore the equilibrium.

DR. G. V. PAREDES, Bogota, Colombia. The subject interests everybody in the profession. I have practiced the use of cocaine, not because I am fond of extracting teeth, but I have had to give experiments with a good many solutions and a good many ways of applying cocaine at my dental college in Bogota. I have found that by wrapping or binding around the tooth a bandage bathed in a ten per cent. solution of cocaine with antipyrin and allowed to remain ten or fifteen minutes will produce a good result. I have al-

Digitized by Google

ways had the idea that it is not good practice to inject solutions of cocaine. There are a good many accidents from it, and I think it is much better not to run the risk in our offices. So I have had no practice with cocaine injections; I never have used them, but I have used it topically with good effect.

The good effects I think depend on the action of the antipyrin and the cocaine; the action of the antipyrin may prevent the unpleasant effects of the cocaine.

DR. AGUILAR, Cadiz. I have not heard anything said this afternoon about the way of preparing the cocaine which would, in my opinion, give the best results. It is undoubtedly a cause of failure in the use of cocaine in many instances that the solution after it has been prepared for some days precipitates and has no action whatever. I have been using for the last two years a preparation manufactured by a man in London, and this contains three centigrammes of pure hydrochlorate of cocaine. You take in a graduated syringe fifteen centigrammes of water, and a dose of the preparation which contains the three centigrammes of cocaine, and you have a solution of six per cent., and you know the amount of solution you are using and the strength. Have a very small mortar where you drop the water, and dissolve it, which it does very readily, and then inject it. I do not agree to a certain extent with the opinion of the gentleman from Colombia, when he says he has good results in extracting teeth by only rubbing cocaine on the gums. I have tried that many times, and never had any good results. When I have accomplished anything it has been by injection, and injections always have been very successful.

Now, another use of cocaine I have found in preventing nausea while taking an impression. I sometimes have used cocaine for this purpose, rubbing over the palate a solution, and so anæsthetizing it partially, taking an impression without nausea or producing vomiting, which is produced without it in many cases.

A way of avoiding the bitter, disagreeable taste of the cocaine, which is undoubtedly very distressing in some

Digitized by Google

cases, is to mix with the solution of cocaine a very small quantity of saccharin. I make the cocaine solution in the proportion of fifty centigrammes of water and three of pure cocaine. I take a very small amount, just what you could get upon the point of a penknife, of saccharin, mix it with the cocaine and thus obliterate the bitter taste of the cocaine almost altogether.

DR. FLETCHER, St. Louis. There is one point that we have not heard brought out this afternoon; that is, the poisonous effect of leaving it in the tissues some length of time. Some operators seem to think it must be injected and left for several minutes, probably as many as fifteen, before operating in order to get the full effect of the drug. I think in that way they gain nothing for anæsthesia, and lose all by poisoning, as by testing with a sharp instrument, as stated in the paper read, you can determine when there is anæsthesia enough for the extraction of the tooth. Then the more quickly you can act the better, for the reason that so soon as the tooth is extracted, the cocaine being in all the tissues surrounding, the bleeding that ensues eliminates the cocaine with the effusion of the blood, so that you get but very little into the circulation, and it cannot possiby get as far as the heart, I think; at least not enough to do any particular harm.

DR. REID, Chicago. I have nothing to say on the subject of cocaine as an anæsthetic, but I believe that we are here for the purpose of saving teeth, and not to extract them, and I think the statements made here in connection with the use of these drugs have a tendency, as a rule, to cause a great deal of extracting that should not be done.

DR. ROSE. I have used a great deal of cocaine in the last four years, both alone and in combination with almost all the other drugs that have been mentioned, and on the whole my experience accords with the author of the paper. It is all well enough to avoid extracting teeth, but it is not altogether right to oppose the use of it for extraction, because the dentists will use it where it should not be used. That is a mistake, and they should only use it where it is necessary.

Digitized by Google

It is used to prevent pain, not for increasing the number of tooth extractions. There is one use of cocaine which has not been mentioned. I find it very useful in case of the removal of pulps. I have often performed operations in this way that surprised me. By rubbing small portions of the cocaine in a mortar or on a glass with a single drop of carbolic acid, and by touching the exposed pulp with what can be carried of this solution on a nerve-broach, I have extracted the pulp painlessly.

DR. HEWETT. Pulps can be extracted painlessly that way if the dentist will use care and a little time. I have done it repeatedly by making a paste of cocaine and glycerine. I would use the glycerine in preference to carbolic acid; you can take that paste, apply it to the bare pulp, if you can get to it, then follow it clear down to the apex, and you can remove it without a particle of pain.

DR. MORRISON, St. Louis. It looks as though from all that has been said, that the use of cocaine by the dental profession is for the painless extraction of teeth.

The abuse of cocaine has been by men who are running shops throughout the country, placing signs from the dome to the pit that they can extract teeth for twenty-five cents without pain.

I hear with regret the essayist call attention to the fact that he extracted two central incisors, and two lateral incisors and two cuspids, by his hypodermic use of cocaine for the insertion of an artificial denture, in this age of modern crown and bridge-work. We should counteract such a detrimental influence that has been produced and is being produced by the advantage claimed to have been gained by the painless extraction of teeth, for I believe from an anatomical or physiological standpoint in the crime next to abortion, comes the ruthless extraction of human teeth.

DR. FLETCHER. We are supposed to be men who are trying to save teeth, and I think the majority of the men on the floor have that in view, and only use the cocaine when it is necessary to extract a useless root or a third molar that is troublesome, or in some of the operations on the teeth where a tooth must be sacrificed for the good of the patient.

Digitized by Google

DR. PRUYN. I want to protest most vigorously against the remarks of my friend Dr. Reid, of Chicago, when he would limit us in our discussions of the use of drugs that are abused by those who are not familiar with them. We want to talk as intelligent men about drugs and their usefulness. I stand here as a medical man, as a graduate of medicine and dentistry, and I propose to talk about any range of drugs in the materia medica that can be used by a dentist; and because some abuse them is that anything to me? I get sick and tired of a discussion where it is assumed that we are all ignorant tooth-pullers because some in the profession abuse it, when we use the drug and use it intelligently. Let us understand the uses of these drugs, and by experiment find what the abuses are and bring them out openly.

I have never yet attended a medical society where any man has tried to limit the discussion of arsenic because men commit suicide with it.

My friend from St. Louis might lead us to infer that some of us who are enthusiastic in the use of cocaine use it for nothing else but the useless extraction of teeth; I want to protest against any such idea. In the experience I have had with it clinically and theoretically, there are cases in which it would be unwise to use cocaine—for instance, in a case of known pregnancy, or where there is any known pulmonary trouble, or where there is a diseased condition of the kidneys, because cocaine has a very marked effect on the kidneys.

I find by experience the best results attend its use after the patient has had a full meal; I have found the toxic effects much more marked when used upon an empty stomach.

If I wanted to use it in a case to any considerable extent, I should first fortify my patient by the use of morphia. To those of you who want to use it, I should advise first to experiment upon dogs, and you will learn the symptoms that you cannot see unless you bring your patient down to death's door. In the dog you may see those signs so well marked that when you see them but slightly in the

Digitized by Google

human being, you will recognize them, and know what to use as the antidote.

SECOND SESSION.

Meeting called to order at 2:30 P. M., Dr. F. J. S. Gorgas in the chair.

The discussion of the subject of local anæsthesia by the use of cocaine was continued, as follows:

DR. HEWETT, of Chicago. The dentist that will day after day place his bur upon sensitive dentine, the pain following which is severer than that of the surgeon's knife in laparotomy, and continue to do so day after day, when within his grasp lies that which will obtund the pain and free the patient from fear, is brutish. I advocate the use of cocaine daily in every dental office. Every time that you pass a gilling twine around a tooth to carry the rubber-dam up high enough to pass the cavities, you inflict pain. You have no right to do that. Whenever you put a rubber-dam clamp on the tooth without first obtunding the sensitive dentine, you are negligent of the first duty of the dentist to his patrons.

There are ways in which painlessness may be acquired in burring sensitive dentine, in cutting down on to the live pulp, in amputating the crown of the live tooth, in amputating exostosis of the jaw, in amputating a tumor that may be situated upon the tongue, in performing any operation upon the mouth with the patient perfectly conscious, able to open his mouth upon request, to expectorate the blood when it is required and absolutely without pain.

I hold in my hands a little vial that contains what I have named, "Compound Cocaine Pigment." I never allow myself to apply the gilling twine to the teeth of my patients before applying this. I have made what some of you may call a shotgun prescription, that is to say, there are eight ingredients, and they are as follows:

Atropin, one-tenth of a grain.

Digitized by Google

I use this for the same reason that Dr. Pruyn told you the other day, that they gave morphine as an antidote, to guard against the toxic effects of the cocaine.

Stropanthin, one-fifth of a grain.

That is the best known heart tonic in existence.

Hydrochlorate of cocaine, one hundred and twenty grains. (Always procure it in clean-cut, rhomboidal crystals.)

Hydronaphthol, ten grains.

This is antiseptic, I think, in the fullest acceptation of the term. I use it constantly to sterilize my instruments as the most convenient one that can be used.

Oil of cloves, two drachms.

Chloroform, two drachms.

Oil of cassia, two drachms.

Glycerine, one drachm.

Oil of cloves and the oil of cinnamon are of themselves largely anæsthetic. The glycerine is simply a solvent to hold in solution the one hundred and twenty grains of hydrochlorate of cocaine together with the oils of the mixture.

I have heard it remarked that a solution of cocaine cannot be maintained after a day or two; it precipitates and deteriorates. If you will incorporate glycerine with your watery solution, you obviate that difficulty. There is a solution of cocaine in my office that is now some six months old, that is as efficacious to-day as it was the day it was made. I simply made it in boiling water, adding a little glycerine, and it holds it in solution perfectly if the water is free from impurities. I recommend this preparation to you with the greatest confidence.

DR. M. L. RHEIN, New York. In the past two years nearly all of the profession have been infused with a desire to find that substance which will produce painless dentistry. I differ radically with the advice the last gentleman has just given. I want to be as emphatic as possible in the disapprobation with which it ought to be met and stamped down by this body—the recommending of the *universal* use of so dangerous a toxic drug as cocaine.

Digitized by Google

There is a very large number of cases where it is almost impossible to use any valuable amount of cocaine, without running the greatest amount of risk. I will not take a back seat with any gentleman in the profession in the effort to abolish pain in dental operations. I feel sorry for the gentleman that cannot adjust the rubber-dam painlessly. The application of cocaine for most purposes is useless unless it is introduced hypodermically. A mere application of the drug superficially on the mucous membrane, beyond the faith which you may instill into the patient, or the delicate manner of your manipulation, will do no good.

There is one great detriment to the world at large that this seeking for painless dentistry is producing, and it is a thing that we ought to understand. The idea of trying to instill into the minds of the public at large that they should not at any time be the subjects of any little pain, means physical degeneracy, a degeneracy from that Spartan-like character which was so much admired centuries ago.

There is a large percentage of patients that do not care for painless dentistry in the ordinary sense of the word. It is absolutely nothing to them. They do not mind operations if they are done with a reasonable amount of care.

In that class of patients that we look upon as neurasthenic it is simply running the risk of making them victims to the use of an intoxicant, which cocaine always is, and which numerous histories of the use of it has established.

In saying what I have, I do not want to leave the impression that I am opposed to the legitimate use of cocaine in dentistry, for I firmly believe it has a well-established place, of great value to the practitioner if used with judgment. I refer now to that class of patients whose systems are not anæmic, whose hearts are in such condition that they can stand the use of cocaine. With that class I believe that the careful injection hypodermically of a good amount of cocaine, the hydrochlorate, before placing a clamp very deeply, or before the immediate separation of the teeth by a separator, or in the extraction of a live pulp or a root, is a very valuable adjunct to dentistry, and one that can be recom-

Digitized by Google

mended to every man who has sufficient knowledge of therapeutics to be enabled to know the proper drug that ought to be used as an antidote, and the skill to be able to take care of his patient if any ill effects follow.

DR. J. G. TEMPLETON, Pittsburg, remarked that he did not rise to dispute what the last speaker had said, but he wished to speak of some operations which he had himself witnessed in Dr. Hewett's office, in which he saw the application of the preparation described by him. In the filling of a cavity in the mesial surface of the lateral incisor, the operator first applied to the gums a solution of chloral hydrate and naphthol for the purpose of absorbing and washing away the mucus on the gums, so that the pigment would take effect, and after an application of the cocaine preparation, the application of the rubber-dam produced no pain.

He saw the doctor extract the root of the tooth of quite an old lady, the second lower bicuspid. The gum was very much inflamed. He dipped a piece of cotton in his preparation, placed it over the root of the tooth, and after a few minutes extracted it without a twinge of pain.

DR. GEO. A. MILLS, New York City, commended Dr. Hewett for his introduction of the idea of painless dentistry. In reference to the statement made by Dr. Rhein, the speaker said, now, the mere statement that cocaine produces these results, and is dangerous and all that kind of thing, is mere trifling. I never have used Dr. Hewett's preparation, but I have used cocaine preparations with other drugs in combination, day in and day out, on sensitive dentine and for the soft tissues in the treatment of disease, and in my experience so far there is not one single instance of evil effect from it.

DR. H. S. LOWRY, Kansas City. I have used cocaine in my practice for six or seven years. If there is any one thing that I would decline to give up in my practice, cocaine would be the last. I use it both in superficial application and by injection. It is more efficacious, however, by injection. I use it more that way than any other. Before I

Digitized by Google

began the use of the drug I studied all its physiological effects and all of its antidotes, and prepared myself to meet any emergency that might occur from its use. I use simply a four per cent. solution of the muriate of cocaine plain and simple, without anything else, in distilled water. I have it made fresh every day, and do not allow myself to use it when it is over two days old. I keep my syringe well sterilized. I have a syringe that I had made to order; it is much longer than the ordinary hypodermic syringe, so that I can reach any point in the mouth with facility.

One point that I think is one of the most important features of hypodermic injection of cocaine is, never inject cocaine into the muscular tissue; if you do, it is carried into the circulation *en masse* to the heart, and you produce heart-excitation and sometimes nausea. But if you inject the cocaine into the hard gum-tissue, being very careful that your needle is so located as to diffuse the cocaine slowly in such a way that you can see the gum whitening gradually and the white surface gradually enlarging, you will rarely ever have any nausea.

DR. RHEIN. What are the anatomical relations of the muscles around and in gum-tissues?

DR. LOWRY. That depends altogether upon the location and what depth it has. You know the attachments of the muscles probably as well as I do. The muscles do not attach up to the gingival margin of the gum, there is no muscle attached to the alveolar process; the alveolar process is almost wholly covered with hard mucous membrane. In some gums the mucous covering over the alveolar process is very thin; in that case you cannot inject cocaine with very much satisfaction. But if the soft tissue is thick, over the alveolar process, you can inject cocaine enough there by placing the needle only once on either side of the tooth. Do not change your needle frequently. If the needle is properly placed and I see it working nicely, I would hesitate about removing that needle to insert it in a different place.

DR. C. S. BIGELOW, Chicago. I have used a saturated

Digitized by Google

solution of cocaine upon the gingival margin in the application of the rubber-dam in very difficult cavities, where I am sure that patients would have been entirely unable to stand the pain of forcing the silk beyond the margin enough to insert a gold filling properly if it had not been for the cocaine. I simply took pulverized cocaine upon my cement tablet, and with a very small pledget of cotton dampened with water, sometimes with alcohol, dipped it in the pulverized cocaine and applied it to the gingival margin. I think the gentleman would have pretty hard work to apply the rubber-dam in all cases painlessly, as he intimated he was able to do.

DR. N. S. HOFF, Ann Arbor, Mich. I do not believe in the indiscriminate use of cocaine, for the reasons already stated, nor do I believe in using prescriptions containing supposed cocaine antidotes, such as we have had presented here to-day. This prescription makes, as I figured, a twenty per cent. solution of cocaine or more. The effects of cocaine are two — general and local. It is the local effect that we want, and not the general effect. But this prescription provides for counteracting the toxic effects of the cocaine; it pretends to make provision against that in the use of sulphate of atropia and stropanthin; these are both heart-stimulants, or rather they stimulate the nerves that control the action of the heart. But the doses are too small for the amount of cocaine that is used. This is a dangerous prescription, even used locally on the gums. You all know the histological structure of the gum-tissue, how slowly it will take up medicine; it absorbs slowly, yet at the same time it will absorb large percentages of cocaine preparations, especially when such agents as chloroform and glycerine are used in connection with them. The cocaine will be taken into the circulation and readily brought to the nerve-centers, and toxic effects will be produced. There is nothing at all in this prescription that is corrective. There is nothing that will hinder the dissipation of this drug or limit its dissipation in the tissues to which it is applied, and it will be taken up by the blood-circulation of the gums and carried directly

Digitized by Google

into the blood-circulation throughout the entire system. The prescription, I have no doubt, will accomplish the local effects which Dr. Hewett says it will.

DR. HEWETT. Let me ask the gentleman how about hydronaphthol as a localizer.

DR. HOFF. The hydronaphthol in saturated solution is somewhat of a coagulant, but in the strength in which you exhibit it it will not hinder the dissipation of this drug, so that I should expect to have bad results from this prescription.

I appreciate the effort that is being made to find a local anæsthetic for use in dentistry as much as anyone. I use cocaine continuously, but I am more inclined to favor the use of the simpler solutions in water alone or in sterilized water.

DR. RHEIN. I want to correct a wrong impression which my words seem to have left. I do not question for an instant the ability to produce local anæsthesia by any such prescription as that; the object of my remarks was to disparage the universal use of cocaine, and I say that any such doctrine as that is injurious. I never intended to leave the impression that I disparaged the possibility of it producing the results. I am in the same position with the gentleman who said he had used cocaine for six years. I have used it since it was first brought into New York City, and I use it every day; and I use it as he says he uses it, I prepare a fresh solution with distilled water, and only use it during that day, and I believe this is the safest way. The point I wish to impress is, that I use it with discrimination. The gentleman stated he used it universally, and he recommended it universally, and great is the danger in any such advice.

DR. G. A. MILLS, New York. What does he mean by universal?

DR. RHEIN. Every place in any form.

DR. MILLS. He meant for painless operations.

DR. RHEIN. As I understood it, whenever he put a patient in the chair and adjusted the rubber-dam. I want to say I never perform an operation on any tooth without first applying a rubber-dam.

Digitized by Google

DR. MILLS. Have you ever used preparations of this kind in combination with cocaine?

DR. RHEIN. I have.

DR. MILLS. Have you found the result which you say is injurious?

DR. RHEIN. My remarks about the use of it were intended to express the feeling I have that it is unsafe to ask dentists to use cocaine on every patient that presents, because there is a large percentage of patients you cannot use it on, or if you do you will end in the penitentiary.

DR. MILLS. I commenced practice before the gentleman was born, and I now put my statement here to show what I have found in intelligent practice. I do not mean that I use this preparation for everything I do in my office, but I use it where I expect to decrease pain, and emphasize the fact that I have never seen any serious conditions following it.

DR. BIGELOW. The two statements of Dr. Rhein seem to me to be inconsistent. One was he did not believe that the external application of cocaine on the gums would amount to anything; he did not think that the gums could possibly absorb enough to produce local anæsthesia; now he says he thinks it is dangerous to use this pigment of Dr. Hewett's, indiscriminately.

DR. RHEIN. I intended to make clear that you cannot get perfect local anæsthesia by that method; but you will get a much greater general effect; that is, the whole system will be the most affected by the topical application.

DR. A. C. HART, San Francisco. There has been a great deal said upon the subject of cocaine, and some of us who are young in practice would be confused and go home from this convention and not know what to do. Really nothing has been said as to what cocaine is, or how it acts. The gentleman to my right has just said he did not think you could bring about local anæsthesia with cocaine by applying it locally.

DR. RHEIN. I did not say anything of the kind.

DR. HOFF. If any of you will go into the offices where

Digitized by Google

men work upon the eye, you will see them put cocaine upon the eye and perform very delicate operations without any pain being experienced.

DR. HEWETT. In reply to my friend, Dr. Rhein, when I advised the use of cocaine, I did it advisedly, knowing I was talking to men of education, of refinement, and careful thought. Shall I enter into the minutiæ and tell them that they must not give a neurasthenic patient cocaine, or a fat man might be a proper subject to use it upon, or that a delicate woman shall not have it, or a little child, and so on? I took it for granted that these men know something. I had only a few minutes, Mr. Chairman, in which to present this. I would like, if I had time, to tell you how I use it, and I defy my young friend to prove that the application of it is injurious.

I have only to say this: I have used that pigment for a long time on all sorts of patients,—upon patients with heart disease, with kidney trouble, with one side paralyzed, with brain trouble, and every conceivable disease that has come into my office, and so far as I know without the slightest toxic effect. Why? Because enough of it cannot be absorbed in the way I use it to enter into the circulation; if it were all put into the stomach at once it would not hurt a baby. Will my friend tell me how much cocaine must go into the stomach to produce a toxic effect? He doubtless knows. If he does know, then he knows that that pigment, diluted as it is, applied to the gums cannot hurt a baby.

I ask you as humanitarians, as men of science, to think of this, read upon the subject, and write to me and ask any questions that you please, and I will answer them with the greatest of pleasure.

DR. J. G. TEMPLETON, Pittsburg, Pa. The question has been asked here, "Why does not some one tell us how cocaine acts?" Does anybody know? We know that opiates all produce certain soporific effects; can anybody tell you how they do that?

DR. CRAVENS. The discussion yesterday and the papers on the subject up to that time in this Section were devoted

Digitized by Google

exclusively and absolutely to the subject of the extraction of teeth, and I protested that there ought to be something else referred to in touching upon the question.

DR. W. P. HORTON. The experience we had in our office in regard to the use of cocaine was that it was very useful in the soft parts and not very useful in the dentine. I have never used it by injection.

The following paper was then read:

OBTUNDING THE SENSIBILITY OF THE DENTINE.

BY W. C. DAVIS, D.D.S., LINCOLN, NEB.

Much has been said by the dental profession upon the means of obtunding the sensibility of the dentine, and there is certainly no better field for the practitioner to investigate. It is a matter which is of vital importance not only to one's individual practice, but to the future success of the profession as well; for the fear of pain during cavity excavation is probably the greatest cause of the neglect of the dental organs. This is fully proven by the way in which dentists eagerly buy the nostrums of the vendors, warranted to make tooth excavation painless; also by the readiness with which patients will enter the offices of men who advertise a painless method. However, I think that what has been said and done in this direction in the past has been a little at random.

If we are going to allay pain during an operation, we should first study its cause and the means by which it is transmitted to the seat of realization.

It seems to have been the aim of all the would-be obtunders to use some anæsthetic, some agent which is by nature itself an obtundent; that is, a drug which has an action on the sensory nerve, either directly or indirectly. I believe this is all wrong.

It cannot be demonstrated that there are any nerve fibres in the dentine, and it can be demonstrated that the dental tubuli are filled with a substance other than nerve tissue. The dental tubuli are far too small to contain the terminal

Digitized by Google

filaments of the sensory nerves, and also the vehicle for the conveyance of blood supply for their sustenance. The nerve tissue cannot live unless it has access to the blood, and it is easily demonstrable that the blood does not enter the dentine. The pulp is well supplied with blood vessels and nerve tissue. The pulp chamber and root canals are entirely lined with a layer of odontoblasts, each of which is connected with one or more of the terminal fibres of the sensory nerves. From the odontoblasts, extending out into the dentine, we have processes called the dental fibrillæ. The tubuli are lined with a seemingly non-destructible sheath and are filled with a fluid, connecting with the odontoblasts. This fluid is protoplasm, not nerve tissue.

Then the question will arise: Is protoplasm capable of transmitting the sensation caused by irritation, which is pain? If so, it can by this means communicate with the odontoblasts, which in turn communicate with the terminal fibres of the sensory nerves. Thus we have connection with the brain. I think it can very easily be demonstrated that protoplasm can transmit the sensation caused by irritation, either mechanical or chemical.

We have the amœba, which is protoplasm. In this amœba we find exhibited all the various phenomena of life; prehension, digestion, assimilation, growth and reproduction, also the exhibition of pain. Irritate the amœba chemically, as with hydrochloric acid, and it will tend to assume a spheroidal shape. Irritate it mechanically and it will endeavor to recede from the irritant, thus exhibiting dislike for the irritant. Now it is not very far-fetched to suppose that the protoplasm contained in the dental tubuli is capable of transmitting the sensation of irritation to the odontoblasts, when we see such exhibitions in the amœba.

Subject the amœba to chloride of zinc or carbolic acid and it will coagulate it, as with all albumenoids. This is true when applied to the dentine. It will coagulate the protoplasm, thus destroying its life and obtunding its sensibility, because we have destroyed the medium through which the sensation is transmitted. This is true of arsenic applied to the den-

Digitized by Google

tine, and if the action of arsenic could be limited to the dentine alone, we would in this agent have a perfect obtundent of the sensibility of the dentine. But as its action is not controllable, the death of the pulp follows its use.

In view of the fact that we know the cause of the irritation and the medium by which it is transmitted; and as this medium is not composed of nerve tissue, and as its destruction is not permissible, nor its coagulation, owing to jeopardy to the pulp; it is my theory that the only means by which the dentine will ever be rendered insensible to the surgeon's instruments is by the removal of the protoplasm from the dental tubuli. This would of itself be sufficient, were it not for the fact that the dentine is anhydrous—capable of again taking up moisture; from within, by capillary attraction; from without, by contact with the atmosphere. As water is a solvent of protoplasm, the medium soon returns to its original confines. It is, therefore, my theory, that after the extraction of the protoplasm, we should deposit in its place another substance which is not in itself capable of transmitting sensation. This is the theory. The profession will vary greatly as to the best means of following it. It will agree with me, however, that the best means of extracting the protoplasm is the application of some agent in itself not injurious to the dentine or pulp; but which has a great affinity for moisture, of which protoplasm is very largely composed. Absolute alcohol is at once suggested. To assist its chemical affinity for moisture, it had best be applied warm, as heat assists chemical action and also favors evaporation.

If hot air is then applied, it will thoroughly vaporize the alcohol, carrying away the moisture it has extracted from the tubuli, leaving them empty. To whatever distance they have been emptied, to that distance we have destroyed the medium for transmitting pain. In other words we have obtunded the sensibility of the dentine. The next step is to fill the tubuli with some other substance. I fill the tubuli with a resinous gum in suspension in a volatile oil. Almost any one of the essential oils will answer the purpose, as they are composed of volatile oils and the resin-

Digitized by Google

ous gum which we need. Probably nothing works better than oil of cassia, as upon the application of hot air the oils are easily volatilized, and if it has been diluted slightly with alcohol, it will readily go into the tubuli as far as they are empty, leaving its gum to fill the space. To this distance you can excavate with impunity, consequently the success of the operation will depend upon the thoroughness with which you extract the protoplasm. In teeth of some structure it seems to be readily extracted to a considerable depth. In others it is next to impossible. I do not think the failure of this method in some cases is due to any nerve structure or nerve complication, or nervous idiosyncrasies of the patient, but rather to the anatomical structure of each individual tooth and each individual cavity. For I sometimes find cavities in the same teeth, perhaps one on either side, seemingly the same distance from the pulp. In one it works perfectly. In the other it is extremely difficult to operate, sometimes meeting with no success. At the same sitting I will find a difference in different teeth in the same mouth. You may ask what I consider the difference in the anatomical structure which would cause such a variance in the result of our attempts to extract the protoplasm. I believe this is partially due to the relation of each tubule to its neighbor, and partially to the size of the tubuli, as they vary considerably. In the relation, I mean they are disconnected, and where they are greatly anastomosed and small, it is impossible to effect them to so great a depth. Again, I believe that where the tubuli are filled to quite a depth with the results of fermentation and micro-organisms, this also hinders us, as alcohol does not have a great affinity for these ferments; consequently they would not be taken up so readily as where the tubuli are filled with unadulterated, healthy protoplasm. In proof of this, I find that it is easier to thoroughly dry the cavity by use of absolute alcohol and hot air after it has been extracted to some depth. Also, in cavities which are decaying rapidly, necessarily being filled to some depth with the products of fermentation and micro-organisms, it does not seem to be so readily taken up as in

Digitized by Google

cavities, for instance, that have at one time been in the process of active decay and it has ceased and become hardened, glazed over and sometimes become black or brown.

The profession has many times resorted to the process of freezing to obtund the sensibility of the dentine. This method will work when the temperature is sufficiently reduced to freeze the protoplasm in the tubuli, thus rendering it in such a condition that it cannot transmit sensation. You find this true of the amœba as well. If cold is applied, its activity is lessened; if a moderate degree of warmth is applied its activity is materially increased, until a certain temperature is reached, when it ceases. If a sufficient amount of hot air not permissible in the mouth is applied, its destruction can be made permanent. In conclusion, I would say that I believe there is no method which has partially obtunded the sensibility of the dentine, whether freezing, superheating, application of caustics or devitalizing agents, etc., that cannot be explained upon the hypothesis given. However, this method of obtunding the sensibility of the dentine will come nearer attaining success than any before presented, inasmuch as I insert a foreign substance in its place, after extracting the medium for transmission of pain.

The profession is at present confronted by those who advertise to sell rights in cities, and claim that they can make their methods universal. In cases where local means seem to meet with failure, a general anæsthetic is resorted to.

Take an ordinary gas apparatus with a Buffalo inhaler, such as is used in giving vitalized air. In the inhaler place one drachm each of alcohol and ether; also four or five drops of nitrite of amyl in solution. Administer as in giving vitalized air. The first effects noticed are those of the gas. Five or six inhalations of this compound anæsthetic are sufficient to produce anæsthesia. The symptoms are similar to those after administration of nitrous-oxide gas alone with addition of the flushed face caused by nitrite of amyl. The anæsthesia from the gas and ether soon passes away, leaving the patient semi-conscious, with the power of conversing with the operator, and seemingly capable of real-

Digitized by Google

izing all that is going on; but there seems to be a temporary paralysis of the fifth nerve, especially the third division, lasting from ten to fifteen minutes, sometimes twenty. It is a fact well known to the medical profession that a few inhalations of nitrite of amyl will give speedy and temporary relief to neuralgia; also the suffocating sensation incident to an attack of asthma; also that upon its administration there seems to be a dilation of the capillaries in the parts supplied by the fifth nerve, as is evinced by the flushed face. Altogether going to show that this drug seems to have a special action on the fifth nerve. This led me to experiment, with the result above stated.

These two methods will make the operation of tooth excavation entirely painless, the result being universal as far as my experiments have gone at present.

For general practice I would not at present care to advise the use of any general anæsthetic for an operation upon a tooth. It is certainly attended with some danger. The amount of danger connected with the administration of an anæsthetic as complicated as the one just given, I am not now prepared to state. However, I believe it to be comparatively safe, as the action of the various ingredients upon the cardiac muscles and region, as well as upon the respiratory organs, is antagonistic.

The following paper was then read:

CHLORIDE OF ETHYL AS AN ANÆSTHETIC.

By Hedwig Bensow Stahlberg, Helsingfors, Finland.

Allow me, since it is impossible for me to be present at the Congress in Chicago, to send a short paper to be read at one of the sessions, that I may thus contribute my mite in securing the purpose of the meeting.

In these few lines I desire to offer a few suggestions in relation to an anæsthetic that has recently been highly spoken of by co-workers in our profession.

Professor C. Redard, of Geneva, was, so far as I know, the first to speak publicly of this remedy; and he demonstrated

Digitized by Google

its practical application at the International Medical Congress in Berlin, 1890. I must not trespass too much upon the limited time of the Congress, but will briefly present my views:

The agent is chloride of ethyl. Its application is very simple, and its effects, after a little practice, generally very satisfactory.

Professor Redard made his demonstration at Berlin by applying the spray in an operation upon the upper jaw, behind the angle of the lower maxillary bone, in the region of the spheno-maxillary fossa; and also in an operation upon the lower jaw, where the inferior maxillary nerve proceeds from the mental foramen. But in experiments of similar nature, by others as by myself, the results were not satisfactory.

In the *Blatt für Zahnärzte* of January, 1893, Hjalmer Carlson (one of the directors of the Dental Institute of Gothenberg, founded by Victor Bensow and Hjalmer Carlson, and one of the first dental schools in the north of Europe,) illustrates the manner in which he uses the agent, which is very much the same as my own method, in which I have secured most excellent results. In the use of chloride of ethyl I apply it directly on the gingivæ and to the immediate neighborhood of the root or roots of the tooth to be extracted. The other teeth in the same jaw, and the inside of the mouth, as well as the tongue, I cover with prepared cotton; because I find that the cotton lies more closely to the surrounding parts than a napkin, as proposed by Dr. Carlson.

This cotton covering should be carefully made, so that it at the same time prevents the patient from swallowing any of the agent.

Just as in using other anæsthetic agents, the time required to secure insensibility is variable. Some patients require only about one grain; others three or four grains, and exceptionally even more. In one case I found that ten grains were necessary to secure anæsthesia.

These circumstances, however, are unimportant; because

Digitized by Google

the agent used is very harmless and it is so cheap that although the largest quantity is required to secure the desired effect, still the poorest patient can afford to use this palliative whenever he needs to submit himself to a painful operation.

Allow me once more to refer to the necessity of carefully covering the parts of the mouth not to be touched by this agent during the operation; because if saliva reaches the locality to be anæsthetized it not only retards and weakens the anæsthesia, but often renders it impossible.

I will remark further, that I apply the fluid solely in the region outside of the affected tooth.

If the time elapsing before the ice crystals appear on the gingivæ is too long, but at the same time the finger with which I hold the cotton layer on the inside of the mouth feels cold, I immediately proceed with the operation, and generally to the satisfaction of the patient.

Professor Carlson's suggestion to wind a warm napkin around the tube containing the anæsthetic I will recommend to everyone who uses it; because the evaporation is thus quickened, and the result, therefore, more successful.

I desire to render prominent, among my honored colleagues, this happily discovered remedy; because I consider it one of the most excellent inventions by which to overcome the annoyance and suffering of the patient which is inseparable from the practice of an operation.

Allow me to remark, in passing, that during the whole operation I usually stand behind the operating chair.

Lastly, I will recommend this agent as put up by Dr. Bengue (Paris, Rue Labruyère No. 34), in glass cylinders containing about ten grams, not on account of the preparation itself, for that of Gaillard P. Monnet and Gartier (Lyons) in glass cylinders, also of about thirty grams, is just as good, but because Dr. Bengue's method of confining the fluid is simple and perfectly secure; while that of the latter is complicated and uncertain.

Another excellent local anæsthetic is, as it is well known, confined carbonic acid; but its distribution is as circumstan-

Digitized by Google

tial as it is expensive. It is difficult of transportation and requires an expensive apparatus for its administration, and it must be preserved in heavy iron cylinders.

DISCUSSION.

DR. LOWRY. I want to speak of one point made by Dr. Davis, of Nebraska, which I think is a very good one, that the tubuli of the dentine are not occupied by a nerve filament; the nerve must be nourished by blood circulation. The tubuli of the dentine are too small for the free circulation of the red blood corpuscles, the red corpuscles being three ten-thousandths of an inch in diameter, and the tubuli only one ten-thousandth of an inch, or one-third the size. Consequently there can be no blood-nutrition to that nerve. Secondly, he says it is a protoplasm. I think that is a good point. The tubuli are occupied by protoplasm. His idea is to apply warm alcohol to the cavity of the tooth, and by its evaporation extract the protoplasm, thereby disposing of the conducting medium, or the medium that conducts the sensation from your instrument to the nerve or the pulp proper.

I have used warm alcohol for probably eighteen months or two years, almost to the exclusion of anything else for obtunding the sensitive dentine. I knew it was of benefit, though I did not know why, but this idea of the essayist has brought it clearly to my mind what the alcohol did do, by its action upon the dentine protoplasm. He fills the tubuli again with some essential oil. I do not know whether it is a good point or not.

So far as the chloride of ethyl mentioned in the last paper is concerned in its application for the obtunding of sensitive dentine, I think it is the most painful thing that was ever administered or put in a cavity. I do not think its effect is so painful upon the gum, but to place it within a cavity for the obtunding of sensitive dentine, it will inflict more pain than the excavation of the cavity without the use of an obtundent.

DR. CRAVENS. Some twenty-one or twenty-two years ago I learned to obtund the sensibility of dentine by the

Digitized by Google

use of alcohol. I was told to use alcohol of a good quality, but nothing was said about absolute alcohol, and for a number of years it never occurred to me what the difficulty was. In some cases I would have very indifferent success, and in some cases none at all, and finally abandoned it. I was lately induced to take it up, and have since applied the absolute alcohol. My observation of absolute alcohol is that the moment you warm it and apply it, it evaporates and does not stay long enough to have any effect, so I have resorted to the simple cold blast. That reduces the temperature of the tooth, but reduces it in a way which is not necessarily painful. After that has been continued awhile I can get it to a point where I can apply ordinary alcohol, say ninety per cent., and evaporate that and follow it with the absolute alcohol, of which I have a bottle right at my hand, and apply it with a little pellet of cotton, with the current of air from the full force of the syringe going continuously, keeping it up one or two minutes.

DR. RHEIN. In the introduction of chloride of ethyl in the past few years, a great many have been led to confound it with chloride of methyl. Chloride of ethyl is so different from the chloride of methyl that it takes about ten minutes in the use of chloride of ethyl to produce by its evaporation a reduction of temperature equivalent to between zero and ten degrees above zero, Fahrenheit, while chloride of methyl, by its greater volatility, in the course of five seconds will produce a reduction of temperature equivalent to seventy degrees below zero—it will freeze the mercury in the bulb of the thermometer in five seconds. I introduced into dental practice the chloride of methyl some five or six years ago, with the object of painlessly excavating a certain variety of sensitive cavities, and I use it to-day very successfully for that purpose, but I discriminate with that material in the same way that I believe every intelligent practitioner ought to discriminate in regard to everything he uses. I find the use of the chloride of methyl almost indispensable, because of the small amount of material required to freeze a limited amount of space in an infinitesimal period of time.

Digitized by Google

Now the danger of it is the possible effect on the pulp of the tooth, and it must not be overlooked. In all the length of time I have used it, I have not to my knowledge had any bad effect on the pulp apart from some slight irritation, following in some cases where I was impelled, more through a feeling of investigation than otherwise, to use it in a deeper cavity than I would use it to-day; but in those very sensitive labial and buccal cavities where we really find the greatest difficulty in commencing to excavate, or where we want to build up the tooth that is very sensitive, in fact all cavities that are remote from the pulp, the most infinitesimal amount of the fluid sprayed from the cylinder direct on the tooth will produce an immediate insensibility of the part if it is used with some little intelligence.

Adjourned.

THIRD SESSION.

On Thursday, August 17th, the Section was called to order by the Chairman, Dr. F. J. S. Gorgas, at 2:30 P. M.

The following paper was then read:

A NEW APPARATUS FOR MAINTAINING ANÆSTHESIA WITHOUT A FACE-PIECE, AND WITH THE MOUTH OPEN.

DEVISED BY THOS. FILLEBROWN, M.D., D.M.D., BOSTON, MASS.

The necessity of repeatedly re-anæsthetizing the patient has always been a great and serious hindrance to the progress and success of surgical operations within and about the mouth and throat. My own experience in operating upon the palate and lips led me to consider the possibility of maintaining the narcosis without interfering with the operation. I am pleased to announce the accomplishment of this object.

Several anæsthetists have used etherized air, in inducing and continuing anæsthesia. Clover used chloroform in this way many years ago, and later applied ether the same way. Messrs. Codman & Shurtleff, of Boston, produced an apparatus for this purpose some years ago.

Digitized by Google

The working of all of the inhaling instruments depended upon the force of the inspiration of the patient to draw the air through the ether, and all except Codman & Shurtleff's provided for the patient to expire back into the instrument.

About two years ago Dr. Horace Packard used a compressible bulb to force the air through the ether, and thus made a very great improvement over the old method, but this still allowed the respiration to pass back into the instrument. The observations of the workings of this inhaler led me to the conception of an apparatus to accomplish the much-desired object of anæsthetizing without sponge, towel, or face-piece.

My apparatus consists of a bellows, connected by rubber tubing with the long tube of a twelve-ounce wash bottle, with a stop-cock intervening to regulate the flow of air. From the bottle extends a half-inch rubber tube to the patient. The bottle is filled one-third full of ether. The bellows is inflated and the stop-cock opened so as to allow the air to bubble up freely through the ether, and to become saturated with ether vapor. The etherized air is then discharged through the second tube a few inches from the patient's face.

This application of ether will maintain complete anæsthesia for any length of time, and not interfere in the least with any operation in or about the mouth; nor will the surplus vapor discharged into the air, sensibly affect either the operator or the assistants.

I have maintained perfect anæsthesia for half an hour in one case to one and one-half hour in another case, without intermitting the operation at all on account of the anæsthesia. This method is not wasteful of ether, as less than one-half pound continued the narcosis the hour and a half; but the waste I should consider of no account as compared with the great advantage gained.

I have made a still further modification of the instrument, and adapted it to the induction of initial anæsthesia, and its maintenance with face-piece for use in general surgery.

All ether inhalers now in use allow all the exhalations to

Digitized by Google

be forced back into the instrument; consequently the patient breathes over and over again the same atmosphere and becomes more or less asphyxiated, instead of truly anæsthetized. Such a plan seems to me unscientific, uncleanly, and unhealthy, in every way undesirable.

To avoid this condition, I have attached to the discharge-tube of the apparatus above described, a double-valve face-piece, such as is used for the administration of nitrous oxide, and a double-end gas bag, for a reservoir. By this means the patient is insured an abundance of pure anæsthetic atmosphere for each inhalation.

At the suggestion of Dr. T. M. Dillingham, I first filled the bag with pure air, and by slowly injecting the etherized air, narcosis is induced with absolute freedom from any of the disagreeable symptoms usually experienced when etherization is accomplished.

I have since found that the same object is better accomplished by raising the tube in the bottle until it is entirely free from the ether, filling the bag, and commencing the inhalation. In this air there will be but a very little ether. Then gradually slide the tube down into the bottle, and as it approaches the ether the strength is increased; after one-fourth of a minute the patient can breathe the full strength.

If the mouth is to be operated on, when anæsthesia is complete, disconnect the bag and face-piece and proceed as before described.

DISCUSSION.

DR. W. J. BARTON, Paris, Texas. I would like to ask Dr. Fillebrown if he could not dispense with the gasbag, by having the administrator press the rubber tubing at the time the patient is exhaling, and allowing it to be open at the time the patient is inhaling.

DR. THOS. FILLEBROWN. I think it would not be quite as convenient, because you have to hold the whole pressure of the column of air, and it would require careful observation to watch the inspiration and expiration, while with this there is no watching at all.

Digitized by Google

DR. H. W. RAY, St. Joseph, Mich. Do you produce anæsthesia quicker by your method than in the old?

DR. FILLEBROWN. I do not, but I produce it without any coughing, because you can control the strength of the vapor so perfectly, and there is very much less emetic results from it.

DR. C. R. TAYLOR, Streator, Ill. There are two or three difficulties I have found in giving general anæsthetics with ether; there is the difficulty of coughing, in consequence of the large inhalation of ether at the start. I would suggest, if Dr. Fillebrown had a tipping bottle there, that would throw the tube so that it would not strike the ether, it could be done all with the one hand instead of using two. I have found difficulty in getting the patient under absolute control, as you may have had with this, in the commencement of the administration of ether or any general anæsthetic; you can get a more immediate and better effect by asking your patient to exhale and inhale several times before you give the anæsthetic.

DR. FILLEBROWN. I think the most delicate way is to put the bag onto the bellows and fill it with pure air first, then proceed, and you will have something that is absolutely nonirritant.

DR. C. R. TAYLOR. Nervous patients are often frightened by the anæsthetic, especially ether, because of its causing coughing.

DR. J. E. CRAVENS. I will say to the gentlemen that if they will have the anæsthetic agent—chloroform, ether, or gas—inhaled through the nose, they will have none of the trouble they mention.

DR. W. J. MORRISON, Nashville, said that the ether would be very likely to damage the rubber tubing in a very short time. He had tried a similar arrangement to that exhibited by the essayist, the bottle being incased in a hot water bath made of a double tin cylinder, so that hot water can be put between the two cylinders and the bottle is set in that, in order to obviate the trouble of the destruction of the rubber. The mouth-piece is a little differently constructed, the face-

Digitized by Google

piece being larger; and for the regulation of the air he placed in the face-piece a valve, and when commencing to anæsthetize the patient he would gradually close that.

DR. FILLEBROWN showed to the last speaker the piece of rubber that had been in use some time, and that it was not damaged in the least; and even if it should become so, he thought he could afford a new set of tubes each time for the sake of the good results.

The following paper was then read:

SUR LES TRAITEMENT DE LA PYORRHŒA.

PAR D. CARACATSANIS, M. D., ATHÈNES, GRÈCE.

On a beaucoup écrit sur cette affection. Ses symptomes et ses causes ont été suivant les opinions de Messieurs Magitot, Galippe, etc., soigneusement étudiés.

Afin de ne pas abuser de votre patience je ne vous parlerai, que des questions qui nous intéressent le plus, son traitement et sa guérison.

J'ai divisé les degrés de cette maladie en quatre, pour faciliter l' explication de mon traitement.

Je définis le premier degrés, quand la suppuration n'a envahi que le collet de la dent, le périoste alvéolo-dentaire est intact. La guérison est des plus facile avec le traitement suivant.

On commencera par enlever tout le tartre ou autres dépots irritants, on scarifiera les gencives autant, que possible et on badigeonnera ensuite avec un instrument d'acier entouré de coton que vous plongerez dans une solution de sublimé à 1 pour 1,000.

On répétera l' opération du badigeonnage avec cette seconde préparation.

Teinture d'iode, teinture d'aconite, en parties égales.

On ordonnera au client de se laver trois fois par jour la bouche, á l'aide d' une brosse avec l' élixir antiseptique suivant.

Digitized by Google

Teinture de thym,	2	grammes.
" d' eucalyptus,	1	"
" de benjoin,	4	"
Alcoolate de menthe,	120	"
" de lavende,	2	"
" de romarin,	1	"
" de cologne,	2	"
" d' anis,	4	"

Cuillerée á café dans un demi verre d'eau tiéde.

Faites revenir la personne an bout d'un mois, élle sera complètement guérie, si elle a suivi toutes vos instructions. Je définis le deuxième degré, quand la suppuration c'est étendue jusqu 'á la partie supérieure du cément.

On fera le même traitement, que pour le premier degré, seulement il sera necessaire de faire revenir plusiéurs fois le client pour scarifier et badigeonner les gencives. Le temps de la guérison pourra étre fixé à deux ou trois fois. Au troisième degré la suppuration a entièrement gagné le cément et le périoste, mais les dents ne sont pas encore complétement ébranlées.

Les séances seront plus nombreuses, la dose du sublime sera augmentéé à 2 pour 1,000.

Après avoir scarifié les gencives á l'àide d'un bistouri, j'introduis dans l'orifice pratiqué, à l'aide de la seringue de Pravaz, la solution de sublime et ensuite je badigeonne avec la préparation de teinture d' iode et d' aconite.

S'il y a inflammation et que le patient souffre, on aura soin aprés avoir enlevé le tartre, d' ordonner des émollients pour la faire disparatre avant de scarifier et de se servir du sublimé.

Le temps de la guérison ne pourra étre fixé, ce degré étant plus difficile á guérir.

Je continue le traitementt, jusque á ce que la suppuration cesse, et que les dents soient á peu près raffermies. J'ai pu remettre en état de manger, des personnes qui souffraient énormément et dont la moindre pression leur causait de douleurs insupportables.

Queant au 4^{m}/ degré que je définis par l'ébranlement

Digitized by Google

complet des dents, on peut y appliquer le même traitement, quoiqu 'il soit rare que l' on obtienne un résultat satisfaisant.

J'ai eu quelques cas de moitié guérison temporaire et ce n 'a été que grâce à la longue patience du client, qui le plus souvent se lasse avant d' avoir obtenu la moindre amélioration.

DISCUSSION.

DR. W. J. BARTON, Paris, Texas. There is one point which I wish to impress. In cases of the third and fourth stage mentioned by the essayist, I would suggest that the teeth be maintained in a stationary condition, which is easily done in most cases by ligatures upon the adjoining teeth, properly adjusted, either of silk or gold binding-wire. It is very important to keep the teeth as immovable as possible during treatment.

DR. JAMES TRUMAN, Philadelphia. I cannot quite reconcile this treatment with my ideas of the disease. The gentleman, as I understand it, takes the position that he must scarify the gums. Now what does he do that for? I would like that question answered. To my mind the gums are not the origin of that disease What is its source? If I understand it, it originates in the pericementum. Pyogenic germs generate there and produce the irritation in the primary stages; as these progress necessarily the pocket deepens, and the gum is left almost intact. Now, why scarify the gums? Is it necessary to scarify anything? If the position I take be the correct one, that it is owing to the microbic influence in the pocket that this disease occurs, then the first thing to do is exactly what this gentleman did, use a powerful agent such as mercuric chloride in the proper solution.

That is the beginning, then he applies iodine and aconite. Now, I cannot comprehend exactly what effect iodine and aconite will have for the checking of this pathological condition. Aconite, if I understand it, is to obtund the nerves more particularly; it paralyzes the nerves, and prevents by their action the influx of blood to a particular part. Iodine

Digitized by Google

is simply an irritant when used in that position, and as far as that goes it has its usefulness; but to my mind, while it may do good, it does not meet the conditions present. We want something more than this. The antiseptic that is used, or may be used, whether it be mercuric chloride, hydronaphthol, phenol, or any other agent, must necessarily be used continuously. I think the great mistake made by operators in this direction is that they do not meet the conditions for the future; they consider the case cured when they leave it after perhaps two or three to six weeks. But that is simply the beginning; if the patient is to be treated properly, it must be continued through the balance of the life of that patient. I never would allow a patient to go from my office and tell him the case was cured without giving him the proper remedies to use, and proper antiseptics to keep the pathogenic germs from producing further decomposition in the future. Unless explained properly, the patient will only return in a few weeks with the case just as bad as in the beginning.

The real scientific data are still wanting in pyorrhœa alveolaris. I am pleased with the paper so far as it goes; it meets some of the conditions, but does not meet them all, nor does it meet them in a way to treat pyorrhœa satisfactorily.

DR. CARACATSANIS replied to the speaker in the French language, stating that he would answer the question of the gentleman by saying he used the aconite and iodine to reduce the inflammation, as a counter-irritant.

DR. CRAVENS. A year ago I reported a case of pyorrhœa alveolaris before the American Dental Association, in which I outlined or indicated a practice perhaps entirely different from that which had obtained up to that time. I also stated I believed the case was cured, and that the patient had only had nine sittings, and that I treated and cured nineteen pockets in the same mouth. The patient has been south for about a year, and returned to my office just a few days ago to have his mouth examined, and there has not been a recurrence of the pyorrhœa alveolaris in a single pocket that

Digitized by Google

I treated. Some of the pockets extended down over the ends of the roots. One of the lower molars particularly, where the excavation extended between the roots, and a syringe placed upon the side discharged the water clear across the tongue. He had had no treatment while away, except about once a month or six weeks he would go to a dentist in a little country town near Nashville, and have him scrape off any external deposits of tartar. There was a bicuspid above, on the right side, that was, if anything, worse. It was the second bicuspid, and had a bifurcated root, a very unusual thing. It was a pretty bad case to clean out. When he returned, the first thing I did was to examine that tooth. I found the gum was closed about as tight as the attachment of the integument around the root of the nail of my finger.

In regard to my treatment. The surgical work must be done thoroughly. If you do not remove all of the calcareous deposit from the root of the tooth, either in pockets or scattered, the case will not get well. If you get all of that out and then follow the treatment I indicate to you, I can safely assure you that you will have resolution in every case. I have had from one to five cases of pyorrhœa alveolaris almost every day, either in the first, second or third stage, and I have not had a failure in the case of a single tooth or pocket that I have treated.

The first step is to scrape the root of the tooth. I do that after anæsthetizing locally, so that it is possible to scrape the root painlessly; then I wash out the pocket with the hot water to get rid of everything that is loose in it. I then apply dilute sulphuric acid (one part of the sulphuric acid to ten parts of water), using the common commercial sulphuric acid. I apply it in two ways, with a syringe, or a common quill toothpick, a very useful thing where you wish to use sulphuric acid or nitrate of silver. It is very flexible, and is not affected by any of the acids you use. I want to fill the pocket with this sulphuric acid, that is all; if it escapes in the mouth it will do no harm beyond perhaps etching the teeth a little bit.

Digitized by Google

That is the end of the first sitting. The sulphuric acid will occasion pain in applying it in that way, but if the operation of scraping has not been very long, you will find that the effect of the cocaine will hold over, so that the sulphuric acid will not occasion any pain. I don't care about the strength you use, but if you think the strength of the cocaine has subsided sufficiently to allow the patient to feel the effect of the acid, apply the cocaine again.

The second sitting is not a surgical one; the first one should complete the surgical part. I begin with the hot water, and thoroughly wash the pockets as many as four or five times with an ordinary plunger syringe, forcing it in with just as strong a pressure as I can make; then I follow with a ten per cent. solution of nitrate of silver. That solution is not caustic, because you cannot get the pockets totally dry. You leave some of the water there so that when you put your silver solution in it is instantly diluted.

I use just enough to fill the pockets, because if you have an excess, and there are any gold fillings in the mouth, it will discolor them; or if you use a great deal, you might very seriously injure the surface of the teeth. One application of the nitrate of silver ought to be sufficient. Then I discharge the patient without any further treatment at that sitting. For the third time I usually allow four days between, though the period might be increased to six. I wash out with the hot water, and for the nitrate of silver I substitute bromo-chloralum, which you can purchase at any drug-store: I believe it is used for a general disinfectant, embalming fluid, and all sorts of things. It is a powerful astringent. I use it with the full strength and in the same way, either with a syringe or with a quill.

There should be but three sittings. If there is pus evident at the third sitting, you will have to scrape the tooth again, because you have not done it properly in the beginning. But if it is done properly, there will be no pus after the first sitting. I then have the patients come once or twice every one, two or three weeks, to have the pockets washed out with hot water, and give them a douche of the

Digitized by Google

bromo-chloralum that is diluted perhaps one to five or six, and I take occasion to examine the case to see if it is all right; but there has been no case in which there was a recurrence of pus.

DR. W. J. BARTON, Paris, Texas. I think it requires proof to make such statements go down. I want to say that the absolute similarity of the treatment is not so important, so that the surgical operation is thorough, so that the treatment is thoroughly antiseptic and cleansing, and the pockets are kept cleansed for the time. That is a very excellent mode of treatment; I like it very much. I have had in my practice cases of seemingly successful cure, and I proceeded in about the same course of treatment. I have in my mind a case which I treated more than a year since, in which there were some very bad pockets. I have had that patient in my office in the last six months, and in the last month before coming here, and carefully examined the case with other dentists to whose attention I called the case. There was an absolute union in that case, and the cure was so perfect in those particular pockets that in the same mouth there occurred other slight pockets, but at this particular place no recurrence whatsoever of the pus was noticed, so that I also can bear testimony to the fact that a certain cure in many cases is possible under right treatment.

DR. HARROUN, Toledo, Ohio. When I noticed Dr. Cravens' system of treatment recommended, I had in process of treatment a very woeful case, where it seemed as though I should lose the teeth, in spite of all I could do. I had removed the third molars of the superior maxilla, which were entirely useless. The second superior molars and the second inferior right molar were very loose; the remaining teeth were firm and solid, no signs of disease upon them anywhere. The other teeth I mentioned were very loose and badly diseased. I could run my instrument through under the upper molar all about the roots, clear down to the points, and could move the tooth in any direction. I had gone through the surgical operation, so I was pretty sure that there were no calcific deposits there that I could

Digitized by Google

reach. I became discouraged, and taking up my books I ran across Dr. Cravens' method, which I tried with entire success in this case, and I desire to state that the method was successful, as claimed by Dr. Cravens.

DR. HART, California. The treatment I have pursued has been very simple. I take it for granted the disease is a disease of the periosteum of the tooth, and the periosteum is dead so far as the disease has advanced. It will go almost to the apex of the tooth, and perhaps three-quarters of the way around.

I begin with a treatment of bichloride of chinoidin. I only use this once, and the next time my patient comes I make a band of No. 60 gold, that goes clear down underneath the gum as far as the pocket has gone, and put it on, encircling the tooth on the other side also, and cement that firmly in position, and I have the best kind of success. The disease seemed to stop after passing that band of pure gold underneath the gum, of course removing all calculus that might be present, but sometimes there is not any.

To allay inflammation I use europhen in a saturated solution in campho-phenique. I use a mouth-wash of hydronaphthol, and it is a splendid mouth-wash.

DR. A. O. RAWLS, Lexington, Ky. I expect that I have grown to be somewhat of an old story in regard to this subject; yet I can see from the drift of the arguments that every one has not got onto the real merits of this trouble yet. I have contended that this was only a local disease.

I have contended all along that it cannot occur in some constitutions, while in others there is no stopping it. I claim that the tissues about the mouth are made susceptible to influences that it is impossible to cure after certain conditions prevail to start the wasting away and the loss of these tissues; that there is no reproduction, of course, upon dead tissue. We will do well if we can stop this melting away of the membrane that lines the socket and invests the root of the tooth aside from causing reproduction. I claim that the original cause of this condition is either inherited or acquired, and a result of the use of mercury. Very often

Digitized by Google

inherited, too, from two or three generations. All you can do by your treatment is to arrest it for the time being. There is no special medicament that is better than a perfect surgical operation, but I apprehend the majority of surgical operations in these cases do not go far enough; they only reach the root of the tooth. In most of these operations you are compelled to go beyond the root of the tooth. The process, as a rule, is broken down, the membrane is entirely swept away, and unless you reach the farthest limit you will have no cure. As to the treatment once or twice being successful in all cases, I do not think it is so. I do not think any one medicament or substance or two or three treatments will cause a successful issue in all cases. Very often cases which are called typical cases of pyorrhœa you will often find are nothing in the world but the result of uncleanliness and negligence, and the accumulation of tartar around the teeth.

DR. TAYLOR. I should say from this diversity of opinion that there were two kinds of pyorrhœa alveolaris; the one we meet in the office, and the one we meet in conventions. The ones we meet in conventions are very easily treated, but those we have to deal with in practice are very difficult, and cause us much trouble and tribulation.

DR. J. Y. CRAWFORD, Nashville, Tenn. We have one distinguished member of the dental profession in this country who has made a statement in reference to this condition and its management, and I regard that statement as sufficient to settle at once the character of this disease: that it is a local manifestation depending upon constitutional conditions in some cases and local conditions in others. This gentleman made the statement that it was a self-evident disease; that he challenged the world to find a single solitary case that did not get well when the teeth are all taken out. That was Dr. W. H. Morgan, of Nashville, Tenn., and to my mind it was the most philosophic expression I have ever heard made upon the subject.

Now, I want to say in the treatment of this disease, as in other forms of diseases of the mouth, two wrongs have

Digitized by Google

existed; one is that in the management of them too vigorous surgery is in many cases applied, and another is too much medication.

In the treatment of wounds superinduced in the operative treatment of pyorrhœa alveolaris, no medicine should be used except to meet the indications that may arise. When you get the parts in a condition of improvement and comfort, let it alone and keep it away from any and all medicine. There is no use to put anything in the cavity whatever, if comfort obtains and the process of restoration is established. Take, for instance, the antrum of Highmore, that may be invaded as the result of pyorrhœa alveolaris; take a cavity like that, that becomes obstructed, inflamed or diseased; open it, and when you get the effect of your treatment, and a condition of comfort established, with no necrosis, with no sloughing or denuding of the covering-membrane of it, let it alone unless some condition arises that demands attention; and so in other cavities of the body. What medicines you do use, let them be intelligently selected; don't put in a septic cavity or during the septic condition a counter-irritant.

DR. CRAVENS, in reply to the preceding speakers, said that the best refutation he could make would be to invite the gentlemen to come to his office and make an inspection of the cases referred to.

DR. HOFF, Ann Arbor, Mich. I do not believe that this disease is always, or that it is often, of local origin. I believe that it is systemic, and I think that you will find in these very bad cases of pyorrhœa alveolaris that all the patients are troubled with diseases, especially of the eliminating organs of the body, the kidneys, the liver, and so on. I first had my attention called to this in connection with the treatment of a patient who had been confined to the desk in an office for some thirty or more years, and his teeth were in this condition; he suffered also from this constitutional complaint, as I afterwards found out, but which I did not know at the time, I treated that man's teeth for several years. I treated them with all the approved methods and substan-

Digitized by Google

tially the method that Dr. Cravens advocates, and he made no progress. I could retard the progress of the disease, but I could not make any progress toward a cure until my patient gave up his business, and went to the South and bought an orange-grove in Florida, and living and working out in the open air a great deal during the winter, and when he came home the following summer I saw him again, and expecting that he had lost all his teeth, I was astonished at the conditions that I saw. When he left the teeth were loose and sore to the touch, but at this time the inflammation was gone from the gums, there was no soreness at all, and he could readily eat with his teeth. Of course the gums had receded, the process had been dissolved and had not been restored, but the other symptoms had disappeared, and I learned that he had had no attention or treatment for his teeth while he had been absent.

I think where we make the mistake is, in not taking into consideration the systemic condition of the patient; and I think when we get fully to understand this disease we will find it has a closer relation to the system and disturbances of the body than we now realize.

DR. CRAVENS. Suppose the case of a gentleman sixty-nine years of age affected with paresis so that he goes along sliding his feet, so that he is nervous and jerky in his motion; furthermore, had been suffering for a year and expected to die almost any time with Bright's disease. Would you consider that a favorable case?

DR. HOFF. I would consider that a very unfavorable case.

DR. CRAVENS. I have had a case of that kind and treated it, and have not been able to find a particle of pus since.

DR. HOFF. You may have done that. It is not a difficult matter to destroy the pyogenic membrane. The treatment you recommend is a detergent treatment, or rather the escharotic effect of your sulphuric acid is a detergent measure, it is not a curative. The only curative agent you employ at all was the nitrate of silver, which in the solution you use is a stimulant, not escharotic. Used in that strength, it stimulates the circulation in the tissues and in that way helps the condition.

Digitized by Google

DR. CRAVENS. We can't cure anything by medicine; we are simply putting the system in condition.

DR. HOFF. We do not try to cure these. In the local treatments you prescribe certain formulas for every condition, but I do not believe they will work. I do not think we can make a specific that will act upon this disease in all cases, because there are different conditions which will keep it active, in spite of all the medicines that you may use.

DR. F. KILLMER, St. Catharines, Ont. I have had some experience in the treatment of this disease, and I very much favor the treatment mentioned by Dr. Cravens. In regard to the causes, I would say that they are local and constitutional, but I think that the active agency in producing the disease in the first place is always a local irritant, and that local irritant may cause this disease to progress more rapidly by certain conditions of the constitution. Where a low state of vitality exists, as in strumous habits, the constitution is in such a condition the teeth may at once set up this disease. A gentleman here said he would like to know the cause of the disease progressing down the side of the root. Now, I thought the peridental membrane for the most part runs lengthwise of the root of the tooth, and any local irritation will cause inflammation; and you all know the process is a softening one, the fibres will assume an embryonic condition and the cells will remain side by side, perhaps still connecting with each other. The mouth is thoroughly infested with micro-organisms, and when you have this condition of the mouth you have at once a state where these micro-organisms can develop rapidly; and if they develop, they insinuate those diseased cells, they follow the line of the membrane, and for that reason they will continue right down to the root of the tooth towards the apex, and you will find it extends to the apex of the tooth before it extends laterally around the tooth.

If there is anything in this theory I advanced that the development of this disease follows the length of the fibres on the root, and that these fibres are excited by the local irritant until inflamed, then the first treatment should be

Digitized by Google

to render that cavity thoroughly aseptic and remove all irritants.

It is a very essential thing that the pockets should have every particle of foreign substance thoroughly eliminated, and before doing this it has been my habit to use some antiseptic to render them thoroughly aseptic before commencing the process of removing the dead process or the little pieces of calcic material and tartar which accumulate in the pus-pockets around the roots of the teeth. If this treatment is thorough I think the case will be cured. I have not had universal success, but I have had great success in treating this disease where the peridental membrane had been destroyed at the apex of the root. I never have been able to get the gum-margin to re-attach. I usually scarify the gum where there is very much destruction of the alveolar process; I cut the gum down freely, and of course as the gum comes together it will leave a notch at the edge of the root, but it will attach firmly.

I would like to emphasize the direction given by several here, to use sulphuric acid and nitrate of silver. I have gone so far as to apply in my first treatment with a goose-quill, a solution that is caustic in its effect. My theory is that in a low state of inflammation you require a strong caustic to produce stimulation.

DR. J. R. BELL, of Cleveland, Ohio, advocates the practice of scarifying the gums, by which means the loose tissue is drawn up around the cervical periphery of the tooth and produces an eschar. Acute inflammation must be established before you can get complete union at that point. Dr. Catching spoke of his method of treating cases of pyorrhœa in which the cause was determined to be injurious food, in which the treatment advocated by Dr. Cravens did not seem to be the proper one. In most cases where the disease becomes chronic, the diet of the patient should be looked after in remedying and correcting the cause of the trouble.

The following paper was then read:

Digitized by Google

EXTRACTIONS DES PULPES DES DENTS COMPLETEMENT CALCIFIES AU MOYEN DE LA TREPANATION.

PAR P. POINSOT, D. H. D. P., PARIS, FRANCE.

Afin de retarder la chute sénile des organes dentaires, nous avous recours à ces deux moyens opératoires bien distincts sé complétant l'ùn par l'antre.

La physiologie nous apprend que la dent reçoit ses moyens de nutrition de deux manières différentes la vie externe, par le ligament peri-dentaire, et la vie interne par la pulpe dentaire, dont la fonction consiste à assurer la calcification de l'organe dans la partie interne de la périphérie au centre, diminuant ainsi progressivement la chamber pulpeuse cette calcification semble généralement complète vers l' âge de trente cinq à quarante ans.

Cependant, pathologiquement, une dent peut devenir cáduque à un âge moins avancé, sous la dépendance de causes générales ou locales; états diathèsiques, on plus simplement, localement, a la suite de traumatismes résultant d'une articulation vicieuse frappant une dent obliquement, ou bien sur un seul point de la face trilurante.

Les résultats pratiques, de notre trépanation, de l'extraction de la pulpe et des filets vasculo-nerveux consiste à supprimer un moyen de nutrition devenu inutile, puisque s'il continuait de se produire, it amenerait infailliblement un état de senéilité anticipé favorisant la chute de l'organe.

En effet: Ces deux moyens de nutritions, externe et interne doivent marcher de pair, jusqu 'à la calcification complète de la dent, mais celle-ci une fois completée, on peut et mème l'on doit, la supprimer, afin qu' elle n'entrave pas la fonction de la première, car, dès qu'une fonction cesse d'étre physiologique elle devient fatalement pathologique, constituant ainsi un véritable danger, il convient donc pour assurer l'intégrité de la première fonction de supprimer la seconde devenue inutile et même dangéreuse, on empêche ainsi le ralentissement sur le point qu' on désire conserver physiologique.

Des causes générales peuvent avancer ou retarder la calci-

Digitized by Google

fication dentaire ; les troubles de la nutrition par insuffisance pourrait y apporter un retard, les troubles de la nutrition par exagération, de la nutrition serait une cause avançant la calcification normale, des causes locales peuvent frapper une ou plusieurs dents contigues, ou bien disséminer dans plusieurs points de la bouche. Parfois même, mais cela est plus rare, on peut constater dans une bouche dont les dents sont au dessous de la moyenne pour la calcification ; une ou plusieurs dents exagérément calcifiées.

Qu' elle qu' en soit la cause, qu' elle soit générale ou locale une fois la calcification complète ou exagérée, bien et duement constatée, nonobstant, l'intéret sémeiologique il y aura avantage d'exécuter notre opération qui consiste a trépaner la couronne de la dent dans l'axe de la chamber pulpaire et au milieu, avec un foret fin pour les dents a racine unique, avec un foret plus fort pour les dents a racines multiples, en ayant soin au préalable, de faire disparaitre l'émail sur le point extrème avec de petits disques de diament ou de corundon, actionner avec le tour dentaire.

2. D'extraire la pulpe dentaire aree les filets vasculo-nerveux a l'aide des tire nerfs en usage après analgésie des tissus avec la phényl-cocaïne, ou bien si les canaux radiculairs étant inaccessibles mécaniquement, a l'aide de l'électrolyse pole positif.

3. Enfin en obturant le canal, ou les canaux dentaires, la chair pulpaire, et la partie trépanée de la couronne, par les différents modes d'obturations communément employés, mais c'est dans ces cavités parfaitement cylindriques, qu' on peut employer comme moyen obturdent, des chevilles de bois comprimées et antiseptisées.

Pour que le résultat le plus complet soit reálisé il faut procéder à l'opération susditte avant que l'état pathologique soit très avancé, en effet, si l'on attend que l'inflammation succédant a l'irritation des files vasculo nerveux soit devenue chronique au point de lésionner le ligament peri-dentaire, avec de la résorption du cément et de l'ivoire devenus graisseux, se compliquent d'altération alvéolaires, si l'on attend, dis-je, un pareil état de chose, immanquablement,

Digitized by Google

l'opération de la trépanation sera inutile, voir méme quelque peu dangereuse, car ces tissus ainsi lésionnés ne supportent pas de semblables traumatismes, c'est alors le cas de recourir aux procédés de résections intra alvéolaires de MM. Martin et Poinsot, voir même aux réimplantations preconisées par Messieurs Magitot David, Castinel, etc., etc.

Notre opération est indiquée, surtout, lorsque la gencive, dépendante et faisant seule, au ligament péri-dentaire sertit, et enchassé solidement le collet de la dent a calcification complète, ou bien, que ce tableau type soit peu modifié par un état pathologique ébauché ce dont on s'assurera par une percussion savante et par l'éclairage électrique permettant l'éxamen des tissus dentaires par transparence.

Adjourned.

FOURTH SESSION.

On Friday, August 18th, the Section was called to order by the Vice-Chairman, Dr. N. S. Hoff, of Ann Arbor, Mich.

The paper on "Extraction of the Pulps from Teeth in a Calcified State by Trepanning," by M. Poinsot, which was read at the preceding session, was then discussed:

DR. J. E. CRAVENS, Indianapolis, Indiana. It is evident that this essay has suffered somewhat in translation. I believe that by trepanning reference was had to tapping the cavity containing a calcifying pulp by drilling.

The following paper was then read:

EXPERIMENTS WITH BICHLORIDE OF MERCURY.

BY CARRIE M. STEWART, D.D.S., ANN ARBOR, MICH.

Because of the peculiar action of bichloride of mercury upon material of an albumenous nature, its efficacy as a germicide, is believed by some scientists, to be less than the standard usually assigned to it.

When brought in contact with the substance to be acted upon the albumen present is superficially coagulated, the

Digitized by Google

interior of the mass escaping many times, because of a lack of penetrating power in the disinfectant.

Such being the case, it has been argued that in the action of bichloride of mercury upon the germs of disease, the same effect is produced, *i. e.*, the external gelatinous capsule of the germ is coagulated, while the internal, vital portion is left untouched, and if by any means the compound between this covering and the disinfectant be dissolved, the micro-organism is quite as ready to manifest its characteristic phenomena as though it had never been subject to the action of the disinfectant.

Acting upon this hypothesis, investigators have endeavored by experimental research to conclusively confirm or disprove the theory, but, as yet, their efforts have not met with success.

A method, which seems very satisfactory so far as showing the effect of certain chemical substances upon the supposed compound formed between the bichloride of mercury and the envelope of the germ, is that used by Dr. McClintock, author of a paper entitled, "Corrosive Sublimate as a Germicide."*

This method has been used in the experiments given here, and freely outlined is as follows: An ordinary test tube is plugged with cotton wool and through this plug is passed a glass rod containing a plug of the same material for part of its length.

In the test tube is a small amount of a non-germicidal alkali, as calcium carbonate or carbonate of sodium, and sodium chloride.

After sterilization, the apparatus is ready for use.

For a definite quantity of the bouillon culture of the germ used was added a definite amount of the $HgCl_2$, strength 1 to 1000. After a given length of time, one c.c. of the disinfected culture was transferred to the prepared test tube and connected with a hydrogen sulphide generator until sufficient precipitation of the mercury had taken place.

Gelatin or agar media was then inoculated with from three to four loops of the preparation and Petri plates made.

* *Medical News*, October, 1892.

Digitized by Google

The chemical action taking place is very manifest, the hydrochloric acid formed being neutralized by the alkali present, sodium carbonate or calcium carbonate.

The sodium chloride solution assists in dissolving the compound formed between the bichloride of mercury and the gelatinous material, or the protecting envelope of the micro-organism.

The germs used in experimenting were the staphylococcus pyogenes aureus and albus because of their frequent occurrence, and, although not spore forming in the common acceptance of the term, they are, nevertheless, very resistant to destructive influences.

This work was done to satisfy myself of the efficacy of bichloride of mercury as a germicide under certain conditions, and although the experiments made were comparatively few in number, they were accomplished with all possible care and accuracy.

1893. April 7th.—Five c.c. of 1:1000 bichloride of mercury to five c.c. of bouillon culture of staphylococcus pyogenes aureus, three days old.

Time of exposure, fifteen, thirty, sixty minutes. Agar plates.

April 11th.—The fifteen and thirty minute plates well developed.

April 27th.—Sixty minute plate still undeveloped.

April 28th.—One c.c. of $HgCl_2$ to five c.c. of culture of the staphylococcus pyogenes albus, fifteen days old.

Time, twenty-four hours. Three agar plates made.

May 8th.—All three plates developed.

April 28th.—Five c.c. of $HgCl_2$ to five c.c. of culture of albus, fifteen days old.

Time, twenty-four hours. Three agar plates made.

May 8th.—No development on any plate.

May 3d.—Fifteen c.c. of $HgCl_2$ to five c.c. of culture of the albus, five days old.

Time, twenty-four hours. Three gelatin plates made.

May 11th.—One colony on each of two plates, the other one being undeveloped.

Digitized by Google

May 3d.—Ten c.c. of $HgCl_2$ to five c.c. of a bouillon culture of the aureus, four days old.

Time, twenty-four hours. Three gelatin plates made.

May 11th.—No development.

May 9th.—Twenty c.c. of $HgCl_2$ to five c.c. of culture of the albus, seven days old.

Time, seventy, eighty-five, one hundred and one hundred and twenty minutes. Two plates for each exposure.

May 18th.—No colonies on the plates of the first two exposures. One of the plates having the one hundred minutes' exposure exhibited one colony while the other had none.

Of the plates having the two hours' exposure, one plate was undeveloped while the other possessed three colonies.

May 11th.—Five c.c. of $HgCl_2$ to five c.c. of the aureus culture, two days old.

Time, fifteen, thirty, forty-five and sixty minutes. Agar plates.

May 22d.—One colony on the plate having the forty-five minutes' exposure, none on the others.

May 15th.—Two c.c. of $HgCl_2$ to five c.c. of a culture of the albus, seven days old.

Time, fifteen, fifty-five and sixty minutes. Gelatin plates.

May 22d.—Plate of the fifty-five minutes' exposure very well developed; others not.

All these experiments were performed with sodium carbonate used as a neutralizing agent, care being taken that a sufficient quantity was used to serve the purpose. In the succeeding experiments, barium carbonate was used instead.

May 16th.—Five c.c. of $HgCl_2$ to five c.c. of bouillon culture of aureus, six days old.

Time, fifteen, thirty, forty-five and eighty minutes. Gelatin plates.

May 26th.—No development in any plate.

May 17th.—Two c.c. of $HgCl_2$ to five c.c. of a culture of the albus, seven days old.

Time, twenty-four hours. Gelatin plate.

May 24th.—One colony.

May 23d.—Five c.c. of acid solution of $HgCl_2$, 1:1000, to five c.c. of culture of the aureus, two days old.

Digitized by Google

Time, five, ten, fifteen, thirty and sixty minutes. Gelatin plates.

June 6th.—No development in any plate.

May 31st.—One c.c. of acid solution of $HgCl_2$ to five c.c. of albus, six days old.

Time, one, five, ten, fifteen and sixty minutes. Gelatin plates.

June 9th.—No development.

June 1st.—Three c.c. of acid solution $HgCl_2$ to five c.c. of culture of albus, nine days old.

Time, one, five, fifteen and thirty minutes. Gelatin plates.

June 9th.—No development.

A little experimenting was done with a solution of HgI_2, 1:500, to test its germicidal process.

When precipitation of the mercury by hydrogen sulphide occurred, the solution was found to be valueless as a germicide; while without the action of the hydrogen sulphide, its effect upon the germs was immediate.

May 19th.—One c.c. of HgI_2, 1:500, to five c.c. of albus culture, four days old.

Time, one, five, ten and fifteen minutes (H_2S employed).

May 22d.—All profusely developed excepting the plate of the ten minutes exposure which had no colonies.

May 19th.—One c.c., HgI_2 to five c.c. of aureus culture, three days old. Gelatin plates.

Time, one, five, ten and fifteen minutes, without precipitation by H_2S.

May 31st.—No development in any plate.

May 23d.—Five c.c. of HgI_2 to five c.c. of culture of the albus, four days old (precipitation of mercury by H_2S).

Time, thirty minutes. Gelatin.

May 31.—Very well developed.

In looking over the results presented here, one will notice now and again a seeming irregularity in the development of a plate; for instance: a plate of fifteen minutes exposure may exhibit no colonies while one of sixty minutes, of the same series, may be well developed. This may be explained by the supposition that only the more feebly resistant germs

Digitized by Google

were transferred to the gelatin, in the first case, and being destroyed by the germicide before the transference, no development could, consequently, take place.

In the latter case a sufficient number of the more resistant germs were brought over to show development under suitable conditions.

Again, enough of the germicide may have been taken over with the germs to have formed a sterilized area around the micro-organisms preventing their growth in the one case, while in the other, the disinfectant was sufficiently distributed throughout the gelatin to prevent anything of the kind. Care was taken to accomplish this in every case, however. The neutralization of the acid formed was also especially looked after.

In comparing the results obtained from the use of the ordinary solution of bichloride of mercury and that of the acid solution, it will be noticed that the latter is far more prompt and efficient in its action than the former, due probably to the excess of hydrochloric acid in the acidulated solution. Although it is manifestly evident that bichloride of mercury is not sufficiently penetrating in its action to serve as a germicide, excepting under conditions most favorable to its complete performance of the results desired, yet the ideal germicide has not been discovered and those that are so efficient as bichloride of mercury are hard to find.

It would seem from the experiments of others, that the more concentrated solutions of this disinfectant are still less to be relied upon in their action than the strengths more ordinarily used, from the fact that the combination between the bichloride of mercury and the capsule of the germ is more quickly effected, and, although the portion influenced is probably of a firmer consistency than that brought about by using a solution of weaker strength, still, the amount of penetration is not so great, and the desired results not so nearly accomplished.

Because of its extremely poisonous nature, bichloride of mercury will never be extensively used alone in dentistry,

Digitized by Google

yet, with a proper knowledge of its powers and those of other germicidal agents of a high degree of usefulness, a combination may be effected in the future, which may prove of the utmost value to the oral surgeons.

The following paper was read:

TRAITMENT DES ABSCES DU SINUS MAXILLAIRE.

PAR E. LECAUDEY, M. D., PARIS, FRANCE.

Depuis plus de trente années, j'ai soigné dans ma clientele une soixantaine au moins d'abcès du sinus maxillaire.

Dans les premiers temps je me servais d'un tube en étain d'un millimètre et demi de diamètre, entaillé á son extrémité et qu' avec une tige recourbée, je le fixais sur la cavité inférieure du sinus.

La pratique m'amèna á constater la longueur de ce traitement et la difficulté avec laquelle se refermait la fistule. Longtemps préoccupé â ce sujet, je lus un jour une thése du Dr. Neillard sur "les fistules anales," où était préconisé le traitement au chlorure de zinc, j'eus alors l'idéc d'appliquer ce traitement aux fistules du sinus, et ne devais en avoir que d'excellents résultats.

Les cas qu il m'á été donné le plus souvent de traiter avaient été occasionnés par les deuxièmes petites molaires, plus rarement par les canines et les premières grosses molaires. Leur traitement a duré généralement de 8 á 21 jours, et n' a jamais dépassé six semaines. L'observation m'a enseigné que plus on laisse peint le conduit fistulaire, plus vite se ferme la fistule. Après avoir opéré l'extraction, je lave soigneusement avec de l'eau oxygénée la cavité du sinus, puis j'injecte la formule suivante:

Chlorure de zinc, 1 gramme.

Acide phénique, 0. gr. 50.

Eau distillée, 100 grammes.

J'interpose simplement, pour tenir la fistule ouverte, une petite mêche de soie enduite de cire; si la fistule, ce qui est rare, ne se ferme pas d'elle même, jé façoune un mince

Digitized by Google

crayon de gutta-percha que j' énduis d'un peu de chlorure de zinc, et le laisse vingt-quatre henres dans la fistule, dont les bords s'avivent et dont la cicatrisation a lieu assez rapidement.

Je puis certifier n'avoir eu jamais, gráce á ce mode de traitement, aucun eas de récidive.

The following paper was then read:

LA BORICINE.

Par M. Denis, D. E. D. P., Paris, France.

Dans un des derniers numéros de L'Odontologie a paru un article fort intéressant sur les propriétés antiseptiques du Boro-borax.

Depuis quelques temps dèja, je fais usage d'un produit identique à peu de chose près; La Boricine. C'est un sel parfaitement défini, résultant de la combinaison à parties égales du borax et de l'acide borique. Ce tétra-borate de soude n'est ni caustique, ni toxique, ni irritant; toutes choses qu'on rencontre assez souvent dans les antiseptiques. De plus il a l'avantage d'être inodore et insipide et de se dissoudre à raison de 16 per cent. J'ai voulu me rendre compte par moi-même de la valeur de ce produit et voici les observations que j'ai recueillies. D'abord je l'ai employé à la désinfection des canaux dentaires et je dois dire que les résultats assez satisfaisants cependant, que j'ai obtenus ne m'ont pas permis de le substituer aux divers antiseptiques connus. Je l'ai appliqué alors au traitement des muqueuses et le résultat en à été surprenant. Au nombre des cas qu'il serait trop long de passer revue, attendu que ces quelques lignes n'ont d'autre prétention que de prendre date pour des communications ultérieures, il en est deux particulièrement intéressants. Le premier sur un sujet rhumatisant est le traitement d'un abcès du sinus survenu par suite de la présence trop prolongée d'une, première grosse molaire droite injectée, ayant occasionné des accidents nombreux consécutifs à la carie du 4° degré. J'enlevai cette dent et

Digitized by Google

sans rentrer dans le détail connu par tous du traitement ordinaire de cette affection, je soignai l'abcès en excludant tous les autres antiseptiques et en me servant uniquement de Boricine. Le deuxième jour la suppuration se ralentissait déja pour s'arrèter tout-a-fait le cinquième. Il y a 3 mois de cela, mon client n'a pas souffert et sa gencive sans étre complétement refermée á repris depuis long temps sa couleur normale. Ce résultat rapide á été obtenu en mettant la valeur d'une cuillerée â café de Boricine en poudre dans la plaie du sinus que j'avais soin d'irriguer avant cette opération avec de l'eau Boricinée á 16 per cent., l'adjonction de la poudre á la solution a pour but de faciliter l'absorption du médicament par les muqueuses d'une manière plus intime et par conséquent plus éfficace. Le 1r jour je fis 3 pansements le 2e le 3e et le 4n jour 2. Le 5e un seul. Toute trace d'infection á disparu, depuis ce temps j'ai revu soúvent mon malade et rien n'est venu modifier ma certitude de l'avoir guéri.

Le second cas est celui d'une personne ayant eu, á la suite d'une extraction malheureuse de la canine gauche et des incisives supérieures la partie antérieure du maxillaire brisée en plusieurs endroits, ces différentes dents étaient affectées de carie du 4n degré ayant occasionné plusieurs abcès alvéolaires chroniques et une fistule gingivale. Un mois aprés l'extraction de ces dents la malade accusait des douleurs sourdes et continues, l'abcès loin de diminuer grossissait chaque jour. C'est dans cet état qu'elle vint me demander mes soins. Ayant remarqué la présence de séquestres, je pratiquai avec le cautére un orifice large d'un centimètre environ á la place qu' occupaient dans l'arcade les incisives droites. Au milieu d'un amas de pus considérable, je fus assez heureux pour enlever plusieurs séquestres de quelques millimètres et un exactement d'un centimétre et demi sur 1 centimétre. Aussitôt cette opération terminée je fís un certain nombre de lavages á l'eau Boricinée á 16 per cent. puis je saturai pour ainsi dire la plaie avec de la Boricine en poudre et je mis une mêche de gaze salolée á l'orifice afin d'empêcher que le trou ne ce refermât trop vite, conséquence qui

Digitized by Google

n'aurait pas permis l'évacuation ultérieure du pus et qui m'aurait empeché de voir si rien n'avait échappé á mon investigation, le lendemain je constatai que l'abcês avait disparu et qu'il n'y avait presque plus trace de suppuration. Je fis le même pansement que la veille saus laisser cette fois de mèche salolée, le surlendemain tout était terminé. Huit jours après la gencive avait repris sinon exactement sa forme, du moins sa coloration normale et aucune complication n'est survenue depuis. Ainsi dans le premier cas collection purulente considérable arrêtée vers le 5e jour, dans l'autre le surlendemain. Je pense donc qu'il serait bon d'en généraliser l'emploi particulièrement pour la muqueuse buccale qui nous intéresse surtout. A l'appui de ces faits je ne pourrai mieux faire que de citer les doctuers Galezowski, Landolt, Hubert, Lagrange, etc., qui emploient maintenant la Boricine dans leurs cliniques à leur grande satisfaction. Comme antiseptique quotidien son usage est nettement indiqué pour s'opposer aux fermentations des parcelles alimentaires retenues dans les interstices des dents et créer un milieu défavorable á la multiplication et à la station des microbes varies qui pullulent dans la cavité buccale attendant une circomstance favorable pour envahir divers organes et y produire des lésions. En résumé j'ai voulu attirer l'attention sur l'emploi et les vertus du nouvel antiseptique que nous saluons á son entrée dans le domaine medical, comptant sur les resources qu'il est sans ancun donte appelé á rendre á notre art par ses qualités qui s'imposent. Il reste encore á parler de ce sel double sur l'émail des dents ce sera le sujet d'une nouvelle étude.

The following paper was then read:

CONTRIBUTION A L'ETUDE DE L'ACTION PHYSIOLOGIQUE DE LA COCAINE.

PAR M. G. VIAU, PROFESSOR DE CLINIQUE A L'ÉCOLE DENTAIRE DE PARIS.

I.

Si nous laissons de côté les légendes du temps des Incas, nous verrons que les chimistes ont les premiers attiré l'atten-

Digitized by Google

tion du monde savant sur les principes immédiats de *l'érythroxylon coca*, que les médecins ont ensuite essayé de tirer profit de la plante, au point de vue thérapeutique, que les physiologistes ont cherché comment l'alcaloïde agit sur les organes et les tissus dans différentes espèces animales. Nous verrons que, se basant sur ces recherches, d'autres praticiens sont arrivés à tirer parti de ces propriétés anesthésiques pour certaines opérations et que les dentistes ont profité des expériences et des recherches antérieures pour essayer à leur tour le problème si ardu de l'anesthésie locale persistante et inoffensive.

Parmi les nombreux travaux publiés sur ce sujet, il faut signaler comme le plus ancien celui de Unanié, imprimé dès l'année 1794.

En 1853, Wedl signalait la présence dans les feuilles de coca d'un alcaloïde, isolé deux ans plus tard par Gardeke, qui l'appela *érythroxyline*. En 1857, Samuel Percy (de New-York) isole à son tour le principe actif de l'érythroxyline et démontre que son chlorhydrate insensibilise la muqueuse linguale. Ces recherches attirèrent peu l'attention jusqu'en 1860. Cette année-là, Niesmann isole à nouveau l'alcaloïde et lui donne le nom de *cocaïne* qui lui est resté.

Cette base cristallise en prismes rhomboïdaux obliques incolores, inodores, peu solubles dans l'eau, plus solubles dans l'alcohol, très solubles dans l'éther.

Elle donne des sels qui cristallisent difficilement, excepté le chlorhydrate. Cette action des acides sur la cocaïne est complexe, car d'après Lossen, l'acide chlorhydrique peut la dédoubler en acide benzoïque et en *ecgonine*, avec laquelle il forme un chlorhydrate [1]. Ces faits expliquent pourquoi on ne peut obtenir la cocaïne en traitant les feulles par les acides. (Rabuteau.)

En réalité les feuilles de coca contiennent :

1° Une cocaïne cristallisée, celle qui est employée ;

2° Une cocaïne amorphe, neutre, inactive ;

3° Une cocaïne liquide, toxique, à action convulsivante. (Lahorde.) [2]

1. *Annales de Physique et de Chimie*, 1862, t. V, p. 482.
2. Duquesnel, *Mém. soc. biol.*, 1884-1885.

Digitized by Google

Lossen, poussant un peu plus loin cette étude, donna pour formule à la cocaïne $C^{17}H^{21}AzO^4$; il fit remarquer qu'à doses faibles, elle agit sur les grenouilles comme la théine, tandis qu'à doses plus élevées elle tétanise les muscles et paralyse les nerfs sensitifs et les colonnes postérieures de la moelle. En même temps, Wöhler découvre une autre substance, l'*hygrine*, dans les feuilles de coca. Niemann obtient des résultats analogues à ceux des précédentes observations. En 1862, Schroff s'occupe de déterminer l'action physiologique de l'alcaloïde récemment découvert, puis vient Moreno y Mais, qui expérimente avec un de ses sels, l'acétate [1]. Après en avoir injecté 5 à 15 milligr. sous la peau des grenouilles, il note: 1° une période d'excitation motrice; 2° une accélération cardiopulmonaire avec mydriase, paralysie des muscles volontaires, et exagération des réflexes[2].

Les médecins tinrent peu compte à ce moment des expériences. Ils s'intéressèrent d'abord à la plante elle-même.

Peu d'années après la découverte du Pérou, le voyageur italien Girolano Benzoni, l'ayant fait connaître en Europe, avait parlé des vertus merveilleuses que lui attribuaient les naturels de l'Amérique du Sud; elle permettait de résister à la faim, au froid, calmait la douleur, etc. Les médecins, absorbés tout entiers par leur culte de l'antiquité, n'accordèrent qu'une médiocre créance a ces récits et ne songèrent pas à utiliser la plante du nouveau continent.

A notre époque on a tiré parti surtout de ses propriétés stimulantes, astringentes et anesthésiques. Demarle notait à titre de curiosité la disparition plus ou moins longue du goût lorsqu'on a mâché les feuilles de coca[3]. Mantegazza les regardait comme un stimulant du système nerveux[4] et Gazeau, un des premiers qui l'ait employée dans les affections de la bouche, l'administrait plutôt comme un modificateur local de la nutrition que comme un calmant[5]. C'est probablement M.

1. *Recherches chimiques et physiologiques sur l'érythoxylon coca.* Th. de Doct. Buenos-Ayres, 1875.
2. Th. de Paris, 1868.
3. Th. de Paris, 1862.
4. *Sulle virtu igieniche e medicinale della coca*, Milano, 1859.
5. Th. Paris, 1870.

Digitized by Google

Fauvel qui a le premier conseillé l'emploi de solutions aqueuses des feuilles de coca dans l'angine glanduleuse comme anesthésique[1].

Peu après, le Dr. G. Coupard recommanda les badigeonnages à la macération de feuilles de coca comme calmants dans les cas de phtisie laryngée[2].

A partir de 1879, des recherches sur l'action physiologique de la cocaïne furent entreprises d'une façon suivie. Les premières furent faites dans le laboratoire de Rossbach, à Würzbourg, par von Anrep[3]. Ce consciencieux observateur reconnut, à la suite d'expériences pratiquées sur lui-même, que l'injection sous-cutanée d'une certaine quantité produit une anesthésie complète sur une zone peu étendue. Les injections furent faites à l'avant-bras et à la langue. Le mémoire de von Anrep marque une nouvelle phase dans l'histoire de la cocaïne. Les conclusions furent adoptées d'un côté, rejetées d'un autre, mais elles servirent de base à toute une autre catégorie de travaux. Les plus remarquables qui aient été faits chez nous sont ceux de MM. Vulpian, Laborde, Grasset, Arloing, Laffont, Richet et Langlois; nous aurons l'occasion de résumer leurs conclusions.

Une communication de M. K. Köller à la Société impériale et royale de médecine de Vienne fit, pour l'adoption en clinique, ce qu 'avaient fait les expériences de von Anrep pour les recherches physiologiques. Comme cet auteur enregistrait des résultats plus objectifs et plus pratiques, on s'en occupa plus vite et on y attacha une importance beaucoup plus grande qu 'à ceux du laboratoire de Würzbourg. Comme l'a fait remarquer Rossbach[4], c'étaient probablement eux qui avaient conduit Köller à l'emploi de la cocaïne en oculistique. Il déclara, du reste, en termes explicites, dans la première communication, que c'est à cause de l'action anesthésique bien connue des badigeonnages de cocaïne sur la langue qu'il a eu l'idée de s'en servir pour l'œil[5].

Son travail arrivait au bon moment: les documents dont

1. *Gaz. des hôpitaux*, 10 et 12 mai 1877.
2. *Tribune médicale*, no. 732, oct. 1881.
3. *Pflüger's Archiv*, Bol. 21, p. 47.
4. *Cocaïn als örtliches Anästhesicum*, *Berl. Klin. Wochenschr.* n° 50, p. 802; 1884.
5. Sitzungsber. der K. K. Gesellschaft d. Aerzte in Wien, 17 Octobre 1884.

Digitized by Google

nous avons cité les principaux, communications, discussions aux sociétés savantes, articles publiés un peu partout dans les journaux de médecine, avaient amené le public à l'idée que la cocaïne était capable de rendre beaucoup plus de services qu'elle n'en avait rendu jusqu'alors. M. Köller répondit aux questions que chacun formulait en déclarant et démontrant que c'était le meilleur et le plus sûr des anesthésiques locaux applicables sur la conjonctive oculaire. Tous les spécialistes médicaux qui ont eu affaire aux muqueuses s'efforcèrent de tirer parti de cette notion. La communication avait été faite le 17 Octobre 1884, dans les publications périodiques des deux derniers mois de l'année. On trouverait une quantité respectable d'articles tendant à démontrer que la cocaïne peut être utile en laryngologie, en otologie, en gynécologie, etc.

Les dentistes ne furent pas les derniers à s'engager dans la voie que l'on venait d'ouvrir. On les trouve expérimentant à l'origine tous les modes d'anesthésie, qu'il s'agisse d'éther, de protoxyde d'azote, de cocaïne, de chlorure de méthyle, d'éthyle, etc., et cette intervention s'explique par la nature même de leur art. Ni la science, ni les études, ni les spéculations générales ne valent la nécessité pour conduire aux découvertes.

A toutes les heures de leur vie professionnelle les dentistes doivent compter avec la douleur. On a beau rejeter l'avulsion dans la petite chirurgie et déclarer que c'est une opération sans importance, les patients ne sont guère touchés de ce raisonnement. La douleur allonge les opérations, augmente leur difficulté, rend parfois extrêmement laborieuses des interventions insignifiantes, telles que le nettoyage et la préparation d'une carie limitée, à plus forte raison l'alvulsion.

Les physiologistes qui avaient expérimenté sur eux-mêmes s'étaient apercus que l'injection sous-cutanée produisait une zone peu étendue d'anesthésie complète. Depuis Köller l'action produite par le badigeonnage des muqueuses était connue: on avait tiré depuis longtemps des effets anesthésiques des feuilles de coca dans un certain nombre d'affections bucco-pharyngées; l'adoption méthodique et raisonnée

Digitized by Google

de la cocaïne en chirurgie dentaire était donc imminente. Il est à peu près impossible de savoir au juste quel fut le praticien qui l'employa le premier. Vers la fin de l'année 1884, un Américain, Robert Hall, se fit à lui-même une injection de cocaïne dans l'épaisseur de la joue pour faciliter une intervention chirurgicale. L'opération fut à peu près indolore. La relation fut publiée vers la fin de l'année.[1] A la même époque deux de ses compatriotes, Weld et Shears, proposèrent de s'en servir régulièrement pour l'enlèvement du tartre et pour calmer les douleurs produites par l'exposition de la pulpe. Après avoir nettoyé à l'alcohol la gencive, on faisait un badigeonnage à la solution de cocaïne; un petit tampon trempé dans la même solution était introduit dans la cavité de la dent à pulpe dénudée; plusieurs fois même Shears fit des badigeonnages répétés de la gencive (deux fois en cinq minutes), immédiatement avant l'extraction, et celle-ci fut presque indolore. Horton obtint les mêmes résultats en injectant quelques gouttes d'une solution à 4% dans une cavité de carie.[2]

Bientôt un dentiste de Vienne, Hillischer, reprit ces expériences avec plus de suite. Il déclara que ses recherches personnelles lui avaient démontré que la cocaïne était inoffensive et qu'elle donnait une anesthésie suffisante pour l'extraction. Cependant son procédé d'application était encore un peu primitif: il faisait des badigeonnages de la gencive en introduisant dans la cavité de la dent à enlever du chlorhydrate de cocaïne pulvérisé.[3]

Un dentiste anglais, Morgans Hughes, employa de la même manière des tampons d'ouate trempés dans une solution à 10%, qu'il introduisait dans les cavités pour calmer les accès d'odontalgie.[4]

Un peu plus tard, dans le cours de l'année 1886, Georges Andina proposa de faire précéder l'extraction des dents de l'injection de 50 centigrammes d'une solution à 15% de chlorhydrate de cocaïne, ce qui faisait 75 milligrammes de

1. *New-York Med. Journal*, décembre 1884.
2. *New-York Med. Record*, déc. 1884, p. 657.
3. *Wien. Med. Wochenschr.* 1885, no. 2, p. 39.
4. *Brit. Med. Journal*, 1885, p. 1253.

Digitized by Google

sel, dose notablement plus élevée que celle qu'on emploie aujourd'hui. Une moitié était introduite sous la muqueuse, une autre à l'intérieur de l'alvéole. L'auteur terminait sa courte note par les conclusions suivantes:

1° La cocaïne est un anesthésique puissant pour les avulsions dentaires qu'il rend presque toujours absolument indolores;

2° La dose moyenne de 7 centigrammes ne présente aucun danger; les seuls effets désagréables qui se sont produits sont des nausées avec lourdeur de tête, qui cessent presque toujours après l'extraction.[1]

Dès l'année 1884, à la séance de novembre de la Société d'Odontologie de Paris, le Dr. David faisait part d'un premier essai heureux de badigeonnage au chlorhydrate de cocaïne pour anesthésier superficiellement la muqueuse buccale.

A la même séance, M. Poinsot déclara avoir essayé également la même substance, mais il lui semblait que les effets obtenus n'étaient pas supérieurs à ceux de solutions d'acide phénique. Il exprimait l'espoir qu'un jour on trouverait le moyen d'associer ces deux substances et qu'on obtiendrait ainsi un phénate de cocaïne.

A la même séance encore, le Dr. Aguilhon de Sarran formulait des doutes sur l'efficacité de ce nouvel anesthésique, qui, suivant lui, ne devait son action qu'à l'àcide chlorhydrique contenu dans le chlorhydrate!

En 1887, M. Poinsot proposa d'employer l'alcaloïde lui-même dissous dans l'oléo-naphtine ou vaseline liquide et obtenait d'excellents résultats[2].

Je ne saurais avoir la prétention d'étudier l'historique complet de la question dans un article dont le cadre est forcément restreint, ni de citer les noms de tous ceux qui s'en sont occupés, non plus que les résultats exacts obtenus par eux, j'ai essayé simplement de donner une idée exacte des tentatives multiples faites de différents côtés pendant les

1. *Revue med. de la Suisse romande*, 1886, no. 7, p. 440.

2. Comptes-rendus du Congrès dentaire international de 1889, Paris, Lecrosnier, p. 180.

Digitized by Google

années qui précédèrent immédiatement l'adoption de la cocaïne en chirurgie dentaire.

En France elles soulevèrent plus de défiance que d'enthousiasme. M. Dujardin-Beaumetz, se basant sur l'opinion de MM. Galippe et Magitot, décourageait les dentistes en leur déclarant formellement qu'ils n'avaient rien de bon à attendre de la cocaïne[1]. M. Cruet, rendant compte d'un article de M. Barker de Brooklyn paru dans un journal professionnel américain, l'*Independent Practitioner*, et dans lequel ce confrére disait avoir obtenu des résultats satisfaisants en injectant la solution de cocaïne sous la gencive au niveau de la *rainure de la dent* (*?*) déclarait que les résultats étaient peu probants, que les badigeonnages des gencives, dont les effets restent superficiels, sont peu utiles parce que la douleur causée par l'extraction a une source profonde qui n'est pas atteinte par l'action anesthésique; qu'en somme la substance en question ne peut en aucune manière répondre au desideratum cherché par les dentistes.

On hésitait en France, en Angleterre, aux Etats-Unis, tandis qu'en Allemagne et en Autriche l'anesthésie par la cocaïne gagnait chaque jour du terrain. J'ai fait 500 extractions en m'en servant, disait Sandré, de Vienne, et je n'ai jamais constaté que les effets ne se soient pas produits[2]. Georges Bock, de Nuremberg, déclarait cet agent indispensable dans toutes les opérations buccales un peu longues, et cependant il avait eu un accident assez sérieux après l'injection de 6 centigr. de chlorhydrate (30 centigr. d'une solution à 20%)[3]. J'ai réservé à dessein pour la fin le nom du praticien allemand qui a été l'un des premiers vulgarisateurs de la méthode et de ses défenseurs les plus convaincus, le Dr. Ad. Witzel, d'Essen[4]. Il affirma hardiment, en s'appuyant sur une expérience personnelle très étendue, que la cocaïne était le moyen si longtemps cherché de supprimer la douleur dans l'extraction des dents[5].

1. *Année médicale de Bourneville*, 1885.
2. *Die Cocustände u. das Cocaïn. Wien.* 1886.
3. *Deutsche Monatsschrift für Zahnheilkunde*, 1886.
4. *Deutsche med. Wochenschrift*, 1886, p. 92.
5. *Ueber Cocaïn-Anästhesie bei Operationen in der Mundhöhle.* Hagen, J. W., 1886, Vorträge.

Digitized by Google

J'ai dit, dans ma communication à la Société d'Odontologie, le 12 octobre 1886, et dans la brochure que je publiai peu de temps après[1], quels services m'avaient rendu les recherches de Witzel. Dans le cours des années 1884 et 1885 on fit à l'Ecole dentaire de Paris des tentatives comparables à celles que nous avons vues pour introduire les préparations de cocaïne en chirurgie dentaire. Le Dr. Aubeau eut de bons résultats en appliquant localement des tampons de cocaïne imbibés dans une solution de 5 à 7%; il essaya même les injections sous-gencivales, mais la dose employée étant trop faible, elles ne donnèrent à peu près rien. Depuis cette époque nous avons eu tous connaissance des remarquables résultats obtenus même en grande chirurgie par MM. Reclus et Isch-Wall[2].

Au mois de septembre 1886, M. Telschow, de Berlin, vint vulgariser à Paris la méthode de Witzel. Nous fûmes tous émerveillés de ses succès. Il est vrai qu'il y avait une ombre au tableau: sur huit malades anesthésiés par la cocaïne, deux présentèrent des troubles momentanément inquiétants. Nous fûmes obligés de conclure que la dose de 10 centigr. employée par M. Telschow était trop élevée, et c'est à la suite de cette constatation que je commencai les recherches dont je communiquai les résultats à la Société d'Odontologie le mois suivant. La modification que j'apportais à la méthode de Witzel consistait à diminuer notablement la dose de cocaïne injectée, tout en lui associant les propriétés anesthésiantes de l'acide phénique cristallisé. Il me sembla que le mélange ainsi obtenu était bien un *phénate de cocaïne*[3]. Cette méthode a été étudiée et discutée, dès le lendemain du jour où je l'ai proposée, par M. Lagrange[4].

Depuis elle a été préconisée de nouveau et recommandée

1. *De l'anesthésie locale obtenue par les injections sous-gencivales de cocaïne et d'acide phénique*, Paris, Lecrosnier et Delahaye. 1886.

2. Reclus et Isch-Wall. *Revue de chir.* 1889, p. 149.—*Gazette des Hôp.* 1891, p. 182.—*Congrès français de chir.* 1889, p. 422.—*Revue Scientif.* 26 mars 1892.

3. De l'anesthésie locale obtenue par les injections sous gencivales de cocaïne et d'acide phénique, Paris. Delahaye et Lecrosnier, 1886, p. 9.

4. De l'anesthésie avec les injections phéniquées et cocaïnées en chirurgie dentaire (*Bull. gén. de thér.* 30 déc. 1886).

Digitized by Google

comme un des meilleurs moyens de prévenir les intoxications cocaïniques par un Américain, le Dr. Isidor Gluck[1].

Le phénate de cocaïne a été préconisé aux États-Unis comme succédané du chlorhydrate. En Allemagne il est employé aujourd'hui d'une façon courante.

II.

Comme nous l'avons fait remarquer, la communication de Köller était arrivée au bon moment. Dès qu'elle fut connue en France, on se mit à étudier les propriétés du médicament préconisé, à entreprendre des expériences nouvelles ou à reprendre des expériences oubliées. C'est ce que fit, un des premiers, le Dr. Lahorde; il avait été entretenu à differentes reprises par M. Coupard des propriétés anesthésiques des feuilles de coca et de leur utilité dans les affections ulcéreuses du pharynx et du larynx. Cet ingénieux praticien était même allé plus loin; il avait commencé, à peu près vers la même époque que von Anrep, une série d'expériences qui ne furent malheureusement jamais terminées. "En 1880, dit M. Laborde, M. Coupard avait entrepris, avec un de ses amis, malheureusement enlevé par une mort prématurée, le docteur Bordereau, des expériences physiologiques à l'aide d'un sel de cocaïne préparé par eux-mêmes, le chlorhydrate."

"Nous possedons le résumé brut d'une de ces expériences, qui mérite d'autant plus d'être reproduite que ses résultats sont tout à fait caractéristiques de l'action des sels de cocaïne et qu'ils offrent une complète anologie avec ceux que nous a donnés depuis à un degré supérieur d'intensité, il est vrai, le sulfate cocaïne[2]."

Le jour où M. Laborde fit sa première communication à la Société de biologie, Vulpian fit connaître à l'Académie des sciences le résultat de ses recherches sur le chlorhydrate de cocaïne[3].

Malgré les études nombreuses qui ont été faites en

1. New-York Med. Record, 1889, t. I. p. 707.
2. Comptes rendus et Mémoires de la *Société de biologie*, séance du 22 novembre, p. 635.
3. Comptes rendus, t. XCIX, Nos. 20-21, pp. 836-886, 1884.

Digitized by Google

France et à l'étranger, il s'en faut de beaucoup que tous les points obscurs aient été élucidés. Nous ne saurions passer en revue même les travaux importants; nous nous bornerons à indiquer les conclusions de quelques-uns.

Pour étudier l'action de la cocaïne sur les tissus et sur les organes, les physiologistes ont interprété les phénomènes observés dans ses applications thérapeutiques; ils ont expérimenté sur eux-mêmes, sur des grenouilles, sur des lapins, des cobayes, des chiens et des singes. Il y a lieu de distinguer à cet égard des effets locaux et des effets généraux.

Tout le monde est à peu près fixé sur les effets locaux. Qu'elles soient appliquées en badigeonnages, injectées sous la peau ou dans la profondeur des tissus, les préparations de cocaïne produisent une analgésie complète en un temps variant de deux à trois minutes: elle paralyse les extrémités nerveuses sensitives laissant intactes les fonctions de la continuité des nerfs.

Comme l'a dit M. Compain[1], elle porte sur tous les tissus au contact desquels la solution peut arriver.

"Les parties imprégnées peuvent être brûlées, coupées, dilacérées, le sujet n'accuse aucune douleur, mais la sensation de contact est conservée. Il y a donc analgésie et non anesthésie[2] (Langlois). Ces phénomènes sont accompagnés de pâleur des téguments dans la zone correspondante, de telle sorte que certains observateurs croient pouvoir attribuer l'analgésie à une action vaso-constrictive de la cocaïne. Comme l'a fait remarquer justement Arloing, l'insensibilité de la cornée ne peut pas être attribuée à l'anémie de la région, car elle se produit aprés comme avant la section du sympathique cervical[3]. Il y a donc là une marche parallèle et non une relation de cause à effet. La cocaïne agit donc sur les terminaisons des nerfs sensitifs; d'après Mosso, elle supprimerait également la capacité de conduction des nerfs moteurs[4]. Son action sur les muscles est variable: à dose faible ou moyenne, elle les paralyse, tandis que des

1. Injections hypodermiques de chlorhydrate de cocaïne. Th. de Paris, 1885.
2. La grande Encyclopédie, Art. cocaïne.
3. *Lyon médical*, 1885, p. 79, 116.
4. Pflüger's. Archiv, t. XLVII, p. 553.

Digitized by Google

doses élevées introduites rapidement dans le torrent circulatoire augmenteraient d'autant leur puissance de contractibilité, surtout s'ils sont fatigués (Mosso).

L'action générale est moins connue. Les phénomènes notés chez l'homme, à la suite de l'administration de doses trop élevées, sont la pâleur de la face, la tendance aux syncopes, l'agitation, la mydriase et l'analgésie générale. On les a recontrés à un degré plus ou moins marqué chez les animaux. Nous avons étudié l'action de la cocaïne parallélement avec la tropa-cocaïne sur les cobayes[1]. Chez le chien comme chez le lapin, l'injection intra-veineuse de 5 à 10 milligrammes par kilogramme de poids détermine une période d'excitation qui dure plus ou moins longtemps ; elle est précédée dans quelques cas d'une phase de stupeur très courte[2]. Chez le singe, M. Grasset a vu presque dès le début de violentes attaques épileptiformes[3]. Dans tous ces cas il y a une grande dilatation pupillaire ; c'est un des effets les plus constants de la cocaïne. Berthold a remarqué que lorsque les instillations d'atropine ne peuvent plus augmenter la mydriase, la cocaïne l'exagère encore. Comment expliquer ces phénomènes ?

M. Laborde rattache les mouvements convulsifs au bulbe. Mosso rapporte tout aux cellules ganglionnaires de la moelle. Lorsque la cocaïne est mise en contact avec toutes les ramifications nerveuses et leurs terminaisons, la sensibilité persiste, dit-il, tant que le segment correspondant de la moelle n'est pas empoisonné. MM. von Anrep, Damm, Richet et Langlois ont vu les convulsions cesser après la section de la moelle. La mydriase et la propulsion du globe de l'œil tiennent à une action de la cocaïne sur le sympatheque. M. Nikolsky fait remarquer que chez l'homme la cocaïne paraît exciter dès le début les centres psycho-moteurs.

La cocaïne injectée sous la peau et surtout dans les veines agit rapidement sur la pression intra-artérielle. Vul-

1. *Essais d'anesthésie locale en chirurgie dentaire au moyen de la tropa-cocaïne*, C. Pinet et G. Viau. Société d'Editions scientifiques, 1893.
2. Beugnier-Corbeau, *Bulletin génér. de thérap.* 30 déc. 1884, p. 529.
3. Comptes rendus Acad. des Sciences, t. C, No. 6, p. 364.

Digitized by Google

pian avait déjà remarqué qu'elle s'abaisse d'abord, pour se relever ensuite; il expliquait cette particularité par l'action déprimante exercée par la cocaïne sur le cœur. Von Anrep at Laborde ont remarqué qu'avec des doses faibles ou moyennes l'abaissement était précédé d'une courte période d'élévation. La même remarque a été faite par Berthold et Grünhaque à la suite d'une série d'expériences sur la cocaïne.[1]

On expliqua d'abord ces faits par l'excitation suivie d'une paralysie du sympathique. Berthold rapporte tout au centre vaso moteur encéphalique; il appuie cette hypothèse sur ce fait que la section de la moelle supprime complètement la période d'élévation de la pression artérielle.

Il est probable cependant que la cocaïne exerce une action directe et immédiate sur le muscle cardiaque Presque tous les physiologistes ont insisté sur la diminution précoce de la fréquence et de l'énergie des battements du cœur. M. Lafont a fait remarquer qu'elle marche pour ainsi dire de pair avec l'abaissement de la pression artérielle. Mosso insiste sur ce fait que le cœur est souvent arrêté avant que la conductibilité nerveuse sensitive et motrice soit complètement abolie. Ce savant compare l'action de la cocaïne à celle de la strychnine, il ne voit entre l'une et l'autre que des différences d'intensité.

Indépendamment de l'influence directe qu'elle exerce sur les éléments nerveux et musculaires, la cocaïne, comme le chloroforme, agirait sur le protoplasma de toutes les cellules de l'économie.

En admettant cette théorie, il est facile de s'expliquer son action sur les échanges organiques d'après Testa.[2]

Richet et Langlois ont insisté, comme Grasset, sur les oscillations thermiques chez les animaux cocaïnés. Au moment des convulsions tonico-cloniques caractéristiques de l'empoisonnement, la température rectale peut s'élever à 40, 44 et 45°. Il existe une relation manifeste entre les phénomènes musculaires et thermiques. On peut sauver l'animal

1. *Centralb. f. med. Wissensch.*, 1885, p. 146, 435-625.
2. Il Morgagni. April-Maggio 1886, p. 259-245.

Digitized by Google

en le refroidissant sous un jet d'eau froide; en abaissant la température on voit les convulsions diminuer ou même cesser (Langlois).

Des phénomènes variables et contradictoires ont été observés du côté du rein, soit chez l'homme, soit chez des animaux en expérience. Certains observateurs ont signalé, au cours d'accidents toxiques, une diurèse. Dans la plupart des cas on est en présence d'une anorexie qui dure plus ou moins longtemps suivant le degré de l'empoisonnement. Dans un cas rapporté par Bettelheim et sur lequel nous aurons l'occasion de revenir, la suppression des urines dura 16 heures. Le Dr. Bignon de Lima a attaché à ces accidents une importance beaucoup plus grande que la plupart de ceux qui se sout occupés de la cocaïne. Pour lui le danger principal tiendrait à son action sur le rein: en ralentissant ou en supprimant l'excrétion urinaire, on empêche l'élimination des produits d'oxydation. Si la quantité d'alcaloïde absorbée est suffisante, elle détermine des accidents urémiques rapidement mortels. Cette hypothèse explique assez bien les cas de perte de connaissance et de coma et une partie des convulsions notées dans ces conditions; il faut pourtant tenir compte de la rapidité avec laquelle ces phénomènes se montrent et de leur disparition presque immédiate après l'élimination de l'agent. M. Bignon déclare qu'ils disparaissent d'habitude au bout de deux à trois heures.[1]

Le Dr. Pinet, dans son cours d'anesthésie clinique à l'Ecolè dentaire de Paris, a formulé ainsi, d'après le remarquable traité d'anesthésie du Prof. Dastre, les propriétés physiologiques de la cocaïne:

"La cocaïne n'est pas un anesthésique général. L'anesthésie vraie peut se manifester, mais alors elle est l'expression de l'intoxication cocaïnique arrivée à sa période ultime. C'est donc un anesthésique local.

"Quant à son action sur l'organisme, elle peut se résumer ainsi: la cocaïne est un curare sensitif. Ce curare paralyse les terminaisons nerveuses motrices, ou, comme le dit Vul-

1. Bulletin général de thér. 1886, août 15, t. III, p. 121.

Digitized by Google

pian, fait une section physiologique des nerfs moteurs. La cocaïne, elle, paralyse les extrémités nerveuses sensitives. Ces deux substances n'agissent que sur les terminaisons des nerfs en respectant le tronc, dont l'excitabilité peut cependant, sous l'influence de certaines doses, présenter un certain degré d'hyperexcitabilité. Cependant le curare diffère de la cocaïne en ce que le premier de ces agents paralyse les plexus nerveux vaso-constricteurs, la cocaïne, au contraire, les *excite*. "Cette formule, dit Dastre, contient l'explication de tous les phénomènes observés."

La paralysie des terminaisons nerveuses sensitives explique l'analgésie, laquelle est tégumentaire, superficielle. Les différentes sensibilités pourront être atteintes ensemble ou individuellement et on pourra sentir le contact sans sentir la douleur. Avec un degré plus avancé de l'action de la cocaïne coïncide la disparition des sensibilités sensorielles, "la sensibilité auditive persistant la dernière" (Dastre loc. cit).

Mais cette paralysie sensitive généralisée ne survient pas la première en date dans l'intoxication ; l'excitation motrice la précède et on conçoit cette excitabilité motrice si on se rappelle que la cocaïne à certaine dose excite les troncs nerveux.

A ces deux grands faits s'en ajoute un autre d'une importance capitale, l'action vaso-motrice de la cocaïne. Celle-ci, en effet, détermine l'excitation du système vaso-constricteur. La connaissance de cette action explique un grand nombre des phénomènes cocaïniques ; tels que : décoloration des muqueuses, pâleur de la face et des extrémités, état syncopal cérébral (anémie cérébrale), cardiaque (anémie par vaso-constriction des coronaires), etc.

De cette vaso-constriction résultent une augmentation de la pression artérielle et une accélération des battements cardiaques, ce qui explique pourquoi la cocaïne est nettement contre-indiquée chez les athéromateux, par exemple.

Quant à l'influence du pneumogastrique sur le cœur, elle est conservée ou même augmentée. (Laborde.)

Les filets vaso-constricteurs du sympathique ne sont pas

Digitized by Google

seuls à être excités, le système entier peut subir l'action de la cocaïne (augmentation des mouvements péristaltiques de l'estomac et de l'intestin, dilatation de l'iris, propulsion du globe oculaire, ptyalisme).

La cocaïne accélère la respiration. La température centrale est augmentée, et ainsi que le dit si bien le professeur Dastre, "le refroidissement que l'on constate en touchant la peau pâle et exsangue du sujet est purement extérieur."

"La production et la déperdition de chaleur sont augmentées. La cocaïne donne la fièvre" (Richet).

Telle est donc l'action physiologique de la cocaïne:

1° *Paralysie des extrémités nerveuses sensitives de la périphérie;*

2° *Excitabilité possible, à certaine dose, des troncs nerveux;*

3° *Excitation des vaso-constricteurs.*

Les contre-indications à l'emploi de la cocaïne résultent de ces données physiologiques, et on ne l'emploiera donc pas:

Chez les grands nerveux;

Chez les anémiques à un certain degré;

Chez les aortiques, dans tous les cas;

Chez les individus dont le myocarde a flechi. Etant donné l'action vaso-constrictive possible des coronaires, que ce muscle soit atteint par suite d'une endocardite ou d'une péricardite, d'une intoxication.

On en rejettera absolument l'usage aussi chez les malades atteints d'angine de poitrine, même dans les formes légères, que cette affection soit causée par l'artérite des coronaires, la névralgie, ou la névrite du plexus cardiaque. Il en sera de même pour les malades atteints d'affection des voies respiratoires à forme aiguë convulsive et pour les débilités.

Il y a lieu d'agir avec prudence vis-à-vis des timorés; la peur, comme la cocaïne, produit une action vaso-constrictive; dans ces conditions, l'administration de la cocaïne peut présenter des dangers contre lesquels il est bon d'être prévenu; dans des cas analogues toute intervention chirurgicale, même sans anesthésie, peut être contre-indiquée également. Du reste on a vu des syncopes mortelles résultant du

Digitized by Google

seul fait de l'émotion. Le professeur Verneuil raconte qu'un enfant qu'il était sur le point d'opérer succomba brusquement au contact du dos de son bistouri sur les téguments du cou; pas une piqûre n'avait été faite, pas une goutte de chloroforme n'avait été inhalée!

Une syncope est particulièrement grave chez un cardiaque. Il est toujours indispensable de tenir compte de l'aspect général, d'interroger soigneusement le patient sur son état de santé antérieur, et, si l'on a des doutes, il ne faut pratiquer l'anesthésie que sur un avis motivé de son médecin habituel. Un examen extemporané et rapide fait par un médecin, si expérimenté qu'il soit, ne donne même pas toujours dans ces conditions les garanties nécessaires.

Adjourned *sine die*.

Digitized by Google

Digitized by Google

Digitized by Google

Digitized by Google

Digitized by Google

Date Due

7 DAY

FEB 5 - 1957

Digitized by Google

St

223

LIBRARY RULES

HOURS 11-12 A.M.

1. One book only will be issued on presentation of borrower's card.

2. Books may be retained for a period of four days. Renewal for four days more will be made upon request.

3. A fine of 5 cents per day will be charged on books not returned when due.

4. Borrowers will be charged for all injury to books.

LIBRARIAN'S HOURS

MONDAY AND FRIDAY, 9-12 A.M.
WEDNESDAY, 1-4 P.M.

Digitized by Google